Cities Alliance Project Output

Cities Alliance
Cities Without Slums

China Economic Revitalization by Cities in Heilongjiang Province: A Cities Alliance Supported Programme

Economic Revitalization by Cities in Heilongjiang Province

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East Asia and Pacific Region
Urban Development Sector Unit (EASUR)
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Preface

The City Development Strategy (CDS) program "Economic Revitalization by Cities in Heilongjiang Province", supported by Cities Alliance (CA), was initiated during 2005 based on dialogue between the Finance and Economics Leading Group of Heilongjiang Province in China and the Urban Development Sector Unit of the East Asia and Pacific Region at the World Bank.

The program was implemented between December 2005 and October 2007 through activities and workshops with city and provincial officials. The program addressed strategies for the continued economic development of the Ha-Da-Qi Economic Corridor as well as priority subjects related to each of the larger cities in the corridor: Harbin, Daqing, and Qiqihar.

The program was actively coordinated throughout by Mr. Jiao Yuanchao, Deputy Director, Finance and Economics Leading Group Office of Heilongjiang Province and his staff, under the leadership of Mr. Yu Xiaodong, Secretary General of this Office. Numerous representatives from each of the cities, and from the Heilongjiang provincial government, participated in the program. The city-based activities were coordinated by the Development and Reform Commission of the respective municipality. At the provincial government level, the Ha-Da-Qi Coordination Office was engaged throughout the program.

The Urban Development Sector Unit (EASUR) of the East Asia and Pacific Region at the World Bank was on behalf of the Heilongjiang Province the executing agency for the Cities Alliance (CA) grant which supported the program. Mr. Mats Andersson, Sr. Urban Management Specialist, was the Bank's task manager for the program, assisted by Mr. You Ji, Operations Officer from the Bank's office in Beijing.

A number of international and domestic consultants undertook research and studies on selective subjects under the program, with active participation of the provincial and city officials. The main resulting reports (in full or as summary) are included in this document with the name of the responsible consultants noted. They are also mentioned in Section 1.1 Overview of the Document. The program included a brief study tour to the United States for eleven officials from the province and the participating cities.

Immediately prior to the CA funded activities, an extensive consultancy study "Urban Environment and Services Review for the NOrhteast China (Heilongjiang Province)" was carried out in the cities of Harbin, Daqing, Qiqihar, and Mudanjiang, financed by the Government of Italy. This study also provided input to the CDS activities from an environmental perspective. A summary of the study is included in this document.

Three workshops were held in Harbin during the program: (i) an introductory workshop in December 2005; (ii) a workshop on collaborative approaches to regional strategy development in January 2007; and (iii) a concluding workshop for the program in September 2007. The presentations made at these workshops are available on a CD.

1. Introduction

1.1 Overview of document

This document is a compilation of the main reports produced during the City Development Strategy (CDS) program "Economic Revitalization by Cities in Heilongjiang Province"supported by grant funding from Cities Alliance. After the following sections in this Chapter 1, which introduce Cities Alliance (CA) and the CA supported programs in China to date, and provide a brief overview of the program "Economic Revitalization by Cities in Heilongjiang Province", the document has one chapter on each of the main topics addressed.

Chapter 2 ***"Profile of Three Cities: Harbin, Daqing & Qiqihar with Income Level Analysis"*** was written by *Prof. Athar Hussian, London School of Economics, with support of China's National Statistics Bureau,* and provides an introduction to the three main municipalities in the Ha-Da-Qi Corridor – Harbin, Daqing and Qiqihar. It provides basic administative structures and socio-economic data, and then focuses on the incidence and alleviation measures related to the urban poverty in these municipalities.

Chapter 3 provides a summary of an extensive study ***"Urban Environment and Services Review for Northeast China (Heilongjiang Province)",*** which was undertaken by the Italian firm *C.Lotti S.r.l.* under funding from the Italian Government, and partly in parallel with the CA funded activities. The table of content of the full study report is included as Annex 3.

Chapter 4 ***"Priority Needs for Ha-Da-Qi Corridor Development"*** is a summary of the initial needs assessment carried out in December 2007 as part of the program start-up. This was done by the World Bank during a one day visit to each of the cities Harbin, Daqing and Qiqihar. It was followed by a one-day program start-up workshop in Harbin.

Chapter 5 contains the final strategy report ***"The Ha-Da-Qi Corridor: China's New Frontier"*** prepared by *Prof. Douglas Webster of Arizona State University, and Prof. Cai Jinaming, the Geography Institute of China Academy of Social Science*, based on input from all the other reports in this document. The chapter also includes a "***Strengths- Weaknesses-Opportunities-Threats (SWOT) Analysis"*** produced at an earlier stage during the program by the same consultants.

Chapter 6 – 8 are three substantive and analytical reports by the international firm *ICF International* on: (i) ***"Ha-Da-Qi Corridor Strategy Options",*** which outlines a framework for corridor development, assesses the existing industrial clusters and the related economic foudations (inputs) in the Ha-Da-Qi corridor, and recommends related strategies and organizational approaches for their implementation; (ii) ***"Daqing Diversification Opportunities"*** which includes an assessment of Daqing's industrial cluster opportunities and input advantages, applying a presented cluster-based economic diversification framework; and (iii) ***"Daqing Marketing Strategy"*** building on the findings and conclusions of the previous two reports.

Chapter 9 presents the work on ***"Qiqihar Water/Wastewater Sector Strategy"*** by the *consultant Mr. Larry Quinn* together with the Qiqihar water/wastewater entities. This together with the environmental report in chapter 3, positions Qiqihar to proceed on a comprehensive water supply and wastewater management investment program, subject to the availability of financing. A summary of related environmental aspects in the whole Ha-Da-Qi corridor is included as Annex 4.

Chapter 10 summarizes discussions between *Prof. Douglas Webster of Arizona State University, Prof. Cai Jianming, the Geography Institute of China Academy of Science, and Harbin Urban Planning Bureau* as ***"Harbin's Future: Notes on Urban Planning Possibilities",*** and outlines oppportunities for enhancing urban amenities in selective areas of Harbin.

Selective supporting materials are included as Annexes. In additoin to annexes already mentioned above, this includes:

Annex 2: An extract from a recent China Investment Climate Study by the World Bank for the three Ha-Da-Qi cities, with comparison to a couple of relevant other Chinese cities.

Annex 5: A paper prepared under the CDS program: **"Metropolitan Governance in China: priorities for Action in the Context of Chinese Urban Dynamics and International Expereince"** by *Prof. Douglas Webster and Prof. Cai Jianming.*

The main powerpoint presentations from three program workshops are provided on a CDS as Volume 2 to this document.

1.2 Cities Alliance

The Cities Alliance is a global coalition of cities and their development partners committed to scaling up successful approaches to urban poverty reduction. Cities are proven engines of economic growth and poverty fighters. By promoting the positive impacts of urbanisation, the Alliance supports learning among cities of all sizes, and also among cities, governments, international development agencies and financial institutions. The Alliance is a broad and growing partnership that presently includes:

- Local authorities, represented by United Cities and Local Governments and Metropolis;
- The governments of Brazil, Canada, Chile, Ethiopia, France, Germany, Italy, Japan, Netherlands, Nigeria, Norway, Philippines, South Africa, Sweden, United Kingdom, and United States of America;
- The Asian Development Bank, European Union, UN Environment Programme, UN-HABITAT and the World Bank.

The Alliance Secretariat - housed at the World Bank headquarters in Washington, D.C., carries out the Alliance's mandate and manages its operations.
(Web site http://www.citiesalliance.org; e-mail: info@citiesalliance.org)

Response to city development needs is often through individual sector projects. This approach is becoming less and less appropriate for cities facing multi-sectoral and multi-dimensional challenges. This must sometimes - often geographically as a city-region or urban corridor - be

analyzed and addressed collectively to stimulate or sustain economic growth, and improve quality of life. A CDS activity is both a process and a product, including a process to engage a wide coalition of local leaders to help strengthen the city`s strategies and plans, reviewing its challenges and opportunities. While, taken as a comprehensive program, it identifies ways of enhancing a city`s competitiveness, livability, management, and financial solvency, the programs in China have addressed these subject selectively based on each city's priority need.

The China CDS program supported by the World Bank initially received grant funding from CA to provide assistance in 2001-2002 to the city-region of Changcha -Zhuzhou -Xiangtan in Hunan Province, and to the provincial capital of Guiyang in Guizhou Province, based on their strong interest and different characteristics. A second China grant from CA, with co-financing from DfID (UK), helped strengthen the development strategies of five city-regions - Chengdu, Zhengzhou, Lanzhou, Xinxiang and Erdos. They were selected based on their expressed interest, and in consultation with national entities. This assistance was provided during eighteen months in 2003 – 2004, and emphasized the metropolitan and regional urban perspectives. Metropolitan areas in China are usually anchored by one major city, and often include many medium/smaller cities and county and township towns. With strong urban-rural linkages, the cities and towns play a prominent role in improving the living standard in their surroundings through job creation, facilitating migration, and developing suburban or satellite urban areas. The rural areas also depend on the cities and towns to prosper.

The key objective of the second China CDS program was to assist these areas in developing a metropolitan-wide strategy for economic development, infrastructure development, and regional coordination of environmental and social service activities. In addition, it developed policies at the national level to define the role of such urban areas, particularly in the inland provinces of the country. The concept of metropolitan- and region-based urbanization in central and western China being in an early stage at the time, the program advanced the concept of city-region based urbanization, identified growth patterns (learning from relevant experiences from the coastal areas of China), and helped prepare for corresponding institutional change and strategic processes. Within its resource limitations, the program helped strengthen existing economic and infrastructure development strategies of the cities, and facilitated regional linkages and coordination. It included: (a) a review of current development strategies; (b) participatory consultations with stakeholders on the city/city-region development; (c) thematic studies on economic development, infrastructure, and poverty alleviation; (d) preparation of city-regional development strategies; and (e) a national strategy study for region-based urban development.

Early 2006, CA provided grant support for the "Economic Revitalization by Cities in Heilongjiang Province", focused on economic diversification, strategic urban environmental improvements, and marketing of the Ha-Da-Qi economic corridor, comprising the cities of Harbin, Daqing and Qiqihar. It is believed that the future economic growth of these cities can be enhanced through Ha-Da-Qi Corridor-wide coordinated development. Examples of promoted cooperation were: (i) shared infrastructure along the corridor; (ii) cross-corridor initiatives to improve inputs for industry clusters; and (iii) coordinated national and international marketing of the corridor, its municipalities, and industrial zones. The corridor planning process encouraged government to support industry clusters, not by choosing winners and losers, but by helping each cluster get the economic inputs they need to grow and become more competitive, for example,

related to the environment, land availability, transportation/logistics, finance, innovation, and human resources.

A recently initiated CDS activity "Shanghai Development Strategy in a Regional Context", co-sponsored by GTZ, Germany and the World Bank, is assisting Shanghai in enhancing its role in the Lower Yangtze Delta (LYD) region. This and the previous activities reflect the importance of urban development coordination in China on a metropolitan and regional scale.

1.3 Program Overview

While China has become an international symbol of economic success in the past 20 years, the Northeastern provinces illustrate that some formidable developmental challenges remain as China continues its transition to a market economy. The northeastern region of China, which stretches across Heilongjiang, Jilin, and Liaoning provinces, served as the major industrial base under a planned economy until the mid 1970s. Though the region achieved high levels of urbanization, infrastructure, and education, the region's economic growth has stagnated as compared with the eastern and southern regions of the country since the wake of the reform and opening-up drive. With a high concentration of large state-owned enterprises, industrial growth in Heilongjiang Province averaged about 5% per year since the 1980s, less than half of the national average of over 10%. With natural resource depletion, shifting demand, changing market structure, aging and less competitive industries, and resulting large vulnerable (poor) groups, the Northeastern provinces have sometimes been referred to as a "rust belt region."

The economic revitalization of the region has been placed on the top national agenda since the new national government of China took office in 2003. In Premier Wen Jiabao's words, "efforts should be made to develop Northeast China into one of the important regions – well structured and competitive – to contribute to national economic growth." A series of government measures have been taken to recapture the strong economic performance that once characterized the region's industrial past. Since July 2004, the central government has carried out pilot reforms in value-added tax, social security, and agriculture in the northeast provinces. According to the Ministry of Commerce, in 2004 Heilongjiang Province witnessed some encouraging growth of foreign direct investment (FDI).

For Heilongjiang (and the northeast region) to join China's economic boom, it will have to tackle the problems of its state-owned enterprises (SOEs), and attract new and increased social participation (private sector) activity. As the heavy industries are being restructured and numerous SOEs in the region are shedding excessive labors and welfare roles, employment insecurity has emerged as a serious development challenge. Between 1997 and 2002, one-in-four (25%) of the 34 million redundant SOE workers in China were laid off in the northeastern region. With only 8% of the country's population, the region shares 22% of city dwellers entitled to poverty support. Urban unemployment in Heilongjiang Province is the highest in the country, well above the national average of 4%.

The Vice Governor of Heilongjiang Province had requested broad assistance from the World Bank, including support for infrastructure development. As one of the most urbanized provinces in China (46% urban population) with many large SOEs, the challenges of economic

revitalization and industrial restructuring and the related poverty alleviation and environmental implications lie largely in the cities and their larger metropolitan areas.

Supported by the Cities Alliance, the first City Development Strategy (CDS) activities in China implemented by the World Bank focused on economic development, regional integration, and financial management. A subsequent CDS program in China emphasized city-regional aspects, a participatory approach, and poverty mitigation (this might be redundant). To achieve the highest possible yield for the development prospects of the northeast region, the Heilongjiang CDS initiative built upon lessons learned (positive and negative) from these previous China activities, which supported nine cities. It draws on experiences from cities such as Glasgow in Scotland, the Ruhr area in Germany, and Pittsburg in the USA, as well as the CDS experience from the Santo Andre/ABC Region in Brazil where industrial restructuring and economic transformation have been central themes. Cross-border dynamics and potentials with Korea and Russia are reviewed and considered, as are the cities' competitive position in the national context.

Objectives

The Heilongjiang CDS initiative assists three cities in the Province – Harbin (the provincial capital), Daqing, and Qiqihar– to enhance the effectiveness, equity, and financial sustainability of their City Development Strategies (CDS) focusing on:

- Establishing a regional economic corridor of Harbin, Daqing and Qiqihar;
- Local economic development and industrial restructuring;
- Urban poverty alleviation, including issues related to unemployment, migrants, and women;
- Improvement of the urban environment and related public services; and
- Related investment programs and financial instruments.

The program involved significant stakeholder consultation, including public and private sector entities, representatives of groups directly affected by anticipated future economic change. It aims to enhance the CDS impact in China; includes a review of Heilongjiang's draft 11th Five Year Plan 2006-2010; and provides input to later annual reviews of the same, including institutional and financial arrangements for its implementation. Efforts are being made to enhance city networking in the province and beyond.

Heilongjiang province is at present restructuring its six pillar industries (equipment manufacturing, petrochemical, food processing, energy, pharmaceutical, and lumbering). However the participating cities differ significantly regarding their current industrial structure and population size, as summarized below.

Municipality	**Population (incl. rural)**	**Current Industrial Structure**
Harbin	9.5 m	Comprehensive industrial system, with mechanical and electrical industries as pillars
Qiqihar	5.6 m	Machinery, metallurgy, light industry, and animal husbandry
Daqing	2.6 m	Oil production, petrochemical industry

Methodology and sequencing of activities

Reflecting the key concepts of CDS and the nature of the fundamental urban development challenges facing Heilongjiang and the northeast region, this CDS espouses a conceptual framework to best address the cities' roles in domestic and global supply chains, depending on the competitive strengths of new enterprises and the purchasing characteristics of the local market. Placed within the context of on-going SOE reforms, the analysis includes potential for market access and agglomeration economies, and determines the city or city-region's economic competitiveness in attracting human, financial, and technological capital.

Urban unemployment reduction lies at the heart of the activity. It addresses the socially painful process of industrial restructuring by assessing an attempt to contribute to strengthening human resource skill upgrading and the safety nets that protect workers who have been suffering a fall in their standard of living. This goes hand in hand with policies to facilitate out-migration/re-allocation of labor and skills. Studies of the causes of the urban unemployment and vulnerability are included to feed into the policy analysis and strategy development.

Methodologies applied for CDS to date in China are significantly refined and enhanced. The output from this CDS program has the following characteristics:

(i) Institutionalization: A Coordinating Office at the provincial government level and CDS Teams in the respective participating municipality established. Stakeholders defined broadly. Horizontal city-networking encouraged.

(ii) CDSs based on a participatory SWOT analysis, assessing the strengths and weaknesses of the local economy, culture, and institutions, and developmental opportunities and threats to the cities' and the region with particular focus on the external forces influencing the region.

(iii) Resulting strategic vision for the respective urban area or region, not necessarily "all encompassing", but focusing on a set of selected priority strategic thrusts as identified by the cities for the development of their urban economies with related actions to be taken by identified entities.

(iv) Focus is on the need to restructure the economic systems and generation of new jobs through new enterprises that creates an enabling investment environment, support for business start-ups, etc., and a local economy that is potentially more income-earning friendly to women.

By adopting a consistent but flexible framework for analysis, it is responsive to the particular circumstances and needs of each city. The core areas of detailed research are the following:

(a) economic transition and rejuvenation, which involve studies of the structures of the urban and regional economies; examination of their strengths and weaknesses due to history and current industries; analysis of opportunities and threats for the regional and city development; assessment of the investment climate, analysis of the challenges and opportunities for new local economic development, and identification of potential areas of competitiveness in the context of the evolving city-regional, national, and global economies.

(b) related regional linkage strategies, which identify the potential benefits from enhanced regional development, especially by establishing an economic corridor between Harbin, Daqing and Qiqihar (a high priority of the provincial government); analysis of possible inter-industry linkages in the region; introduction of local and international experiences in promoting regional growth and collaboration for employment generation; and formulation of a strategy to manage the urban environment on a wider regional scale.

(c) related investment needs and modern financing instruments. Some priority urban environmental infrastructure needs are identified and analyzed through the parallel activity funded by Italy. The CDS process enhances this by reviewing needs directly related to the economic revitalization strategies and the potential for public-private partnerships.

2. Profile of Three Cities: Harbin, Daqing & Qiqihar with Income Level Analysis

By Athar Hussain[1]

Executive Summary

Harbin is a sub-provincial city, and Daqing and Qiqihar, prefecture level cities. Following the common Chinese pattern, these cities are divided into urban districts and rural counties. The former constitute the urban core. The latter cover much of the city's territory - around 90% in Harbin and Qiqihar and 75% in Daqing – and house a majority's population. The three cities are sparsely populated. Compared with the national average of 251 persons/sq km, the population densities for the three cities range between 183 (27% lower) in Harbin to 124 persons/sq km (51% lower) in Daqing. The other side of a low population density is higher investment in transport infrastructure and a higher transport cost.

As in other Chinese cities, the population of Harbin, Daqing and Qiqihar is divided in two ways. One is by the place of residence: "city districts" and "rural counties". The other division is according to the entry into the personal register (*hukou*): "non-agricultural" and "agricultural". In the past, the two classifications coincided, bar a few exceptions. Over the reform period, the two classifications have increasingly come to diverge because of rural-to-urban migration and conversion of rural counties into urban districts. As a result, a substantial percentage of the population in urban districts, 21 to 23% in the three cities, is classified as "agricultural". This anomaly matters because access to social services and entitlement to social security depend on the *hukou* entry.

Both Harbin and Daqing have a higher GDP per capita than the national average. In the former, this holds for per capita income in both urban districts and rural counties. But this no longer holds for Harbin when the urban wage rate is used as the index of comparison, which is 20% lower than the national average. Reflecting the impact of the oil industry, the urban wage rate in Daqing is a third higher than the national average. In all three cites the GDP share of farming is a fraction of its employment share, less than half in Harbin and Qiqihar, which fits in with the wide gap between urban and rural per capita income. In all three cities the employment share of farming fell significantly in just one year between 2005 and 2006, because of competition from imports.

Turning to public finances, in the three cities the average per capita revenue in districts is 9 to 16 times that in rural counties, and it varies widely between cities, districts and counties together or separately. In all three cities and in both districts and counties, expenditure per capita is higher than revenue per capita, which indicates transfers from higher government tiers.
The transfers from higher government tiers (provinces and the central government) are substantial and reduce the variation in expenditure per head across the cities; nevertheless significant differences still remain.

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Financing and operating social security schemes, previously minor concerns of city governments, now constitute a major component of their business. A social security system with its own administration, regular sources of finance and separated from the organization of economic activity is largely a development from the second half of the 1990s, one that is still under way. The city Bureaux of Labour and Social Security, which are the mainstays of contributory social security schemes, began to be established only in 1998.

The social security system consists of both contributory social insurance and means-tested social assistance. The latter, which have to be entirely from the general revenue of cities, bring into focus the distribution of expenditure responsibilities and transfers between government tiers, which in its current form is neither equitable nor compatible with sustainability of schemes. Social assistance schemes have risen in importance as the transition to a market economy has removed the protection built into the economic structure, such as employment guarantee and price subsidies.

A major innovation in the field of social security is the introduction of the Minimum Living Standard Assistance (MLSA) for the urban population in 1999 and recently the development of a parallel MLSA for the rural population. The MLSA bridges the shortfall of household per capita income from the local poverty line. The three cities have both urban and rural MLSA and their cost is split between higher government tiers (centre and provinces) and the city government and lower tiers.

1. Territorial Configuration and Administrative Structure

Harbin, Daqing and Qiqihar are located along the corridor running from Harbin (the provincial capital) in the south-east to Qiqihar in centre-west with Daqing in the middle. In the four tier status hierarchy of cities, Harbin is placed in the second rang and classified as a sub-provincial city. The other two have the status of a prefecture and occupy the third rang. While Harbin and Qiqihar have a long history, Daqing has a short but illustrious history. Its origin dates back to 1959 when oil was struck coinciding with the 10th anniversary of the foundation of PRC, hence the name *Daqing* which means "great celebration". It was established as a city only in December 1979. Harbin is one of the six industrial bases chosen in the early 1950s as a favoured site for industrial investment. The city's economy went through a period of decline in the late 1990s but has in recent years been undergoing a revival with the launch of the revitalise the North-East initiative.

In common with the usual geographical configuration of Chinese cities, the three cities include an extensive rural periphery. For the most part, rural areas in China do not lie beyond but inside city boundaries and the rural-urban difference, which has been an abiding feature of the Chinese economy and society runs through them. All but a small percentage of the area of Chinese cities is covered by their rural counties and, as pointed out below, similarly, a majority of the city inhabitants are classified as "agricultural".

At the level of a city, the rural-urban division takes the form of differential relationship city districts and rural counties to the city government. The city districts, more precisely those under the "jurisdiction of the city government", form the urban core with integrated public finances. In

contrast, the rural counties have a looser connection with the city government and have a greater fiscal autonomy than city districts do. The other side of the fiscal autonomy is less sharing of revenue and expenditure between rural counties than that between districts.

Each of the three cities covers a large area, even by Chinese standards. Compared to the national average of 12.4%, urban districts in Harbin and Qiqihar cover only 8 to 10% of the total area (Table 1).

Table 1
Spatial Division into Urban Districts and Rural Counties

Area	Harbin	Daqing	Qiqihar
Whole City, sq km	53,068	21,000	42,469
Urban Districts, sq km (%, Of the whole)	4,272 (8%)	5,107 (24%)	4,310 (10%)
Built-up Area, sq km (% of Urban Districts)	293 (7%)	164 (3%)	103 (2%)

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005, NBS; Beijing

Daqing is an exception among Chinese cities in having almost a quarter of the total area covered by city districts. This is due to the designation of areas with oil wells as urban, which is reflected in its low population density of 237 persons/sq km (Table 2). Further, only a small percentage of the urban districts is taken up by built areas: 7% in Harbin, 3% in Daqing and 2% in Qiqihar The average for all cities and towns, totalling 661, is 5%.

Taking together their urban districts and rural counties, the three cities are sparsely populated. Compared with the national average of 251 persons/sq km, the population densities for the three cities range between 183 (27% lower) in Harbin to 124 persons/sq km (51% lower) in Daqing (Table 2). But the pattern for urban districts is slightly different. In contrast to those of Daqing and Qiqihar, the urban districts of Harbin have a population density higher than the national average for urban districts 924 compared with 600 persons/sq km (Table 2). However, Harbin's urban districts are not as densely populated as this comparison might suggest. They have a lower population density than those of the urban districts in Shenyang and other large cities in Liaoning, which is one of the other two provinces in the North-East. The other side of a low population density is higher investment in transport infrastructure and a higher transport cost.

Table 2
Population Density in Urban Districts and Rural Counties

Area	Harbin	Daqing	Qiqihar
Whole City, Persons/Sq Km (% of National Average)	183 (73%)	124 (49%)	130 (52%)
Urban Districts, Persons/Sq Km (% of National Average)	924 (154%)	237 (40%)	331 (55%)

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005,
NBS: Beijing

As other Chinese cities, Harbin, Daqing and Qiqihar have a three-tiered administrative structure, with the municipal government at the top. The bottom two tiers are classified as urban or rural.

Table 3 presents the administrative structure; "districts", in the first row, and "Neighbourhood Offices", in the second row, are the urban units.

Table 3
Sub-City Level Administrative Structure

Administrative Tiers	Harbin	Daqing	Qiqihar
Districts; County-Level Cities; Counties	8; 4; 7	5; 0; 4	7; 1; 8
Neighborhood Offices; Townships; Administrative Villages	90; 193; 1879		34,63,61

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005, NBS: Beijing

County-level cities, of which there are 4 in Harbin and 1 in Qiqihar, have a particular status. Though counted amongst 661 cities nation-wide, these cities are nested within above-county level cities and are subordinated to them. They have grown rapidly in numbers due to migration, as settlements above a population are granted the status of county-level city. They occupy a special position in the urbanization policy, which lays emphasis on the proliferation of small and medium-size cities and controlling the growth of large cities.

Focusing on the first tier in Table 3, the three cities present different patterns. At one end is Harbin, which comprises 4 county-level cities and exemplifies an urban cluster consisting of a core city surrounded by a number of satellite towns. At the other end is Daqing where the urban core is surrounded by a rural hinterland with no satellite towns within the city boundaries. This reflects Daqing's particular characteristic as a city built around one activity: oil extraction. The stellar pattern, as exemplified by Harbin, is becoming the predominant pattern as rural settlements are elevated to the status of towns to reflect the shift of economic structure away from farming and increased concentration of the population due to migration from the surrounding countryside. The predominance of the pattern simply reflects the fact almost all rural settlements are in the ambit of a city.

In China, as elsewhere, the process of urbanization has taken two forms: first, the expansion of existing urban settlements combined with rural-to-urban migration and, second, the urbanization of rural localities, involving a switch of labour from farming to industry or services without migration, which has been encouraged by the government with the slogan "leave the land but not the village". Compared with international experiences, the second has been far more prevalent in China and the driving force behind it has been the growth of rural ("town and village") enterprises (TVEs). Both have administrative implications. The first is accompanied by an occasional re-designation of rural counties as urban districts. Similarly the second is accompanied by a re-designation of rural settlements crossing a population threshold as county-level cities. This raises the question why during the urbanization process some rural counties change into city districts, while some others remain counties but with county seats elevated to the status of a town? The answer lies in the benefit of the fiscal integration with the city districts compared with that of retaining fiscal autonomy, which differs between counties undergoing the urbanization process.

Each of the units in the first tier in Table 3 is a separate budgetary unit with own revenue sources and expenditure responsibilities. The fiscal status of the units in the second tiers is ambiguous and variable in that they may have their own sources of revenue and may also have expenditure responsibilities. Below the second governmental tier, there are non-governmental units of "community precincts" (*she qu*) in urban areas, which have replaced "residents' committees", and "natural villages" in rural areas. Building on the experience of popular elections for village council in rural areas, the plan is to select member of the "community precinct council" through elections instead of appointment by "neighbourhood offices". Some cities have already had these elections. Together the bottom governmental tier and the non-governmental units play a central role in the operation of social assistance schemes such as the Minimum Living Standard Assistance (MLSA) or its rural counter part, the enforcement of the birth control policy and policing.

From an international perspective, China is unusual in assigning responsibilities for operating most of social security schemes, providing basic education and health care and ensuring public safety to lower government tiers whilst providing fairly limited transfers to finance the provision. Cities at the third and fourth tiers (prefecture and counties), which includes Daqing and Qiqihar, account for all but a small percentage of expenditures for social security: pensions, unemployment insurance, and other income support and welfare schemes. This can create difficulties in meeting social security obligations because the fiscal situation of cities varies widely. Moreover, the cities with a higher incidence of poverty tend also to have strained public finances. The causes of the former may also be responsible for the latter. As outlined below, Qiqihar is an example of the nexus of low income per head, a high poverty rate and strained public finances. There are fiscal transfers from higher to lower government tiers but the framework of inter-governmental transfers remain yet to be worked out so as to fit in with the revenue capacities and expenditure responsibilities of various government tiers.

2. City Population and Its Division

As other Chinese cities, Harbin, Daqing and Qiqihar are overlaid with two grids of classifications. One is the spatial division of the city into "city districts" and "rural counties", which divides the population between urban and rural residents. The other is the division of the city's population into "non-agricultural" and "agricultural" in the personal register (*hukou*). In the past, the two classifications coincided, bar a few exceptions. Except for local officials, residents of rural counties carried "agricultural" *hukou*. But over the reform period, the two classifications have increasingly come to diverge. The principal causes are two: first, a huge increase in rural-to-urban migration and, second, re-designation of rural counties as urban districts with urbanization. Personal registration (*hukou*) does not automatically change following migration even after a long period or the transformation of rural counties into districts. Residents of city districts are not all classified as "non-agricultural"; similarly, the residents of "rural counties" are not all holders of "agricultural" *hukou*. The result is a large population with an anomalous status, as outlined below (Table 4). The *hukou* designation matters because the coverage of social security schemes, access to social provision, such as education and housing, and employment opportunities open to an individual may strongly depend on entries in his/her registration such as agricultural/non-agricultural and the place of residence. As in numerous Chinese cities, in the three cities a wide range of jobs are reserved for residents of urban districts

with "non-agricultural" registration and thus not open to even the residents of towns and rural counties within the city boundaries. Such restrictions lead to a segmentation of the labour market. Moreover, entitlement to social security benefits, such as the “Minimum Living Standard Allowance” that makes up a shortfall of household per capita income from the local poverty line, is only available to the “registered” residents of the locality. In these respects personal registration is akin to the citizenship of a country. However, the procedure for altering the registered place of residence is changing. As in many Chinese cities, in the three cities a migrant can be registered as a regular resident upon finding a regular job or purchasing an apartment. The trend of changes is towards making household registration into a data bank with personal details.

The spatial division of the population between urban districts and rural counties, including county towns, in the three cities is as follows (Table 4).

Table 4
Spatial Division of the Population in the Three Cities

	Harbin	Daqing	Qiqihar
Total City Population (million)	9.7	2.6	5.5
In urban districts (million) (%)	3.9 (40.2%)	1.2 (46.2%)	1.4 (25.5%)
In rural counties (million) (%)	5.8 (59.8%)	1.4 (53.8%)	4.1 (74.5%)

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005, NBS: Beijing

By international standards, the unusual feature of the three cities is that the majority of their city’s population is resident in rural counties not in urban districts. The feature is particularly striking in Qiqihar where rural counties house around three-fourths of the population. The spatial division of the population in three cities fits in with the general pattern in 661cities that there are in China. In the Year 2004, the total population resident within the administrative boundaries of cities was 1,178 million (around 91% of the mainland population), 70% of which was resident in rural counties. Here it is important to emphasise that “rural” in the Chinese context does not necessarily mean “agricultural” and the discrepancy between the two has been steadily widening. Many of the rural counties in the vicinity of large cities derive all but a small percentage of income from non-farming activities and would normally be classified as “peri-urban” in terms of population density and the relative importance of industry and services as sources of income. Thus the observation that the urbanization rate in China is low, which in Year 2004 was officially reckoned to be 43%, is an artefact of the arbitrary nature of the urban-rural distinction in China. The policy implication is that issues characteristic of urban settlements, such as the pollution of the air and water and the provision of public utilities affect a far larger percentage of the population than the official urbanization figure.

The division of the population by the personal status into “non-agricultural” or “agricultural”, which is what is used to measure the urbanization rate in Chinese statistics, is presented in Table 5.

Table 5
Distribution of Population by Personal Status, 2004

Category	Harbin	Daqing	Qiqihar
Non-agricultural (million)	4.7	1.3	1.9
(% Of the total)	(48.1%)	(48.1%)	(35.3%)
Agricultural (million)	5.0	1.4	3.6
(% Of the total)	(51.9%)	(51.9%)	(64.7%)

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005, NBS: Beijing

The percentage share of the population with "non-agricultural" registration in Harbin and Daqing are very similar but that in Qiqihar is substantially lower, in all three the percentage shares are substantially higher than the national average of 31% in 2004.

As in other Chinese cities, the populations classified as “non-agricultural” and as “agricultural” are not separated spatially but inter-mixed, as shown by Table 6.

Table 6
Distribution of District & County Population by Personal Status

	Harbin		Daqing		Qiqihar	
	N-Ag	Ag	N-Ag	Ag	N-Ag	Ag
Districts	76.8	***23.2***	78.6	***21.4***	78.5	***21.5***
Counties	***28.4***	71.6	***21.9***	78.1	***20.2***	79.8

Note: N-Ag: Non-agricultural. Ag: Agricultural. The figures for each city are percentages of the total district or county population. The entries under N-Ag and Ag sum to 100 respectively

In the 2*2 matrix under each city in Table 6, of particular interest are the off-diagonal elements (in bold italics) which represent discrepancies between the spatial division of the population (districts/counties) and that by personal status (agricultural/non-agricultural). A full correspondence between the two divisions is equivalent to the entries of 100% in the diagonal boxes and 0s in the off-diagonal boxes. Non-zeros in the off-diagonal boxes reflect that the two divisions do not coincide. In the three cities between 23 to 21% of the urban district population holds "agricultural" registration. In Daqing and Qiqihar a similar percentage of the rural county population has "non-agricultural" registration. But the percentage in Harbin is much higher. The percentages of the urban district population with “agricultural registration” in the three cities in Table 6 are likely to be under-estimates, as these do not include immigrants who do not register and obtain a temporary residence permit, thus left out from the official count.

3. Economic Ranking and Structure

3.1. Ranking

To compare the three cities with 658 other Chinese towns and cities, Table 7 presents their GDP per capita, in urban districts and rural counties taken together and separately, both in absolute terms and relative to the corresponding national average. It also presents the urban wage rate in the three cities

Table 7
GDP per Capita & Urban Wage Rate Rmb per year, 2004 (% of national average)

	Harbin			Daqing			Qiqihar		
	Combined	Urban Districts	Rural counties	Combined	Urban Districts	Rural counties	Combined	Urban Districts	Rural counties
GDP P.C	17,320 (125%)	27,460 (105%)	10,371 (120%)	47,271 (341%)	96,200 (368%)	5,219 (60%)	7,281 (53%)	13,432 (51%)	5,137 (59%)
Urban Wage rate	15,131 (80%)			26,169 (133%)			12,121 (64%)		

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005, NBS: Beijing

Both Harbin and Daqing have a higher GDP per capita than the national average. In the former, this holds for per capita income in both urban districts and rural counties. But this no longer holds for Harbin when the urban wage rate is used as the index of comparison, which is 20% lower than the national average. Reflecting the impact of the oil industry, the per capita income in Daqing's urban districts is over three-and-half times the national average for urban districts; but this does not translate into correspondingly high city government revenue and household income because much of the revenue from the industry accrues to the central rather than the city government. However, the urban wage rate in Daqing (the last row) is still a third higher than the national average. With a per capita income 40% lower than the corresponding national average, the rural counties of Daqing are relatively poor. The per capita income in Qiqihar is just above half of the corresponding national average, for urban districts and rural counties taken separately and together. Similarly, Qiqihar's urban wage rate is around a third lower than the national average. Qiqihar represents the common pattern in Heilongjiang's eight other cities which all have a per capita income substantially lower than the national average.
Turning to the rural urban gap, the per capita income in the rural counties of each of the three cities is just a fraction of that in the city's urban districts, as shown by Table 8

Table 8
Per Capita GDP in Rural Counties as % of that in Urban Districts, 2004

National	Harbin	Daqing	Qiqihar
33%	38%	5%	33%

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005, NBS: Beijing

Leaving aside Daqing as a special case, the rural-urban gap in Harbin and Qiqihar is very similar to average gap nationally, marginally lower in the latter.

3.2. Economic Structure

The economic structure of a city can be described in terms of four indices:

- the sectoral composition of GDP;
- the sectoral distribution of the employed labour force;
- the spatial division of GDP between urban districts and rural counties;
- public finances

Whereas the first two are applicable to cities all over the world, the third is in some ways

particular to Chinese cities, which reflects their unusual configuration comprising urban districts and rural counties

Sectoral Composition

The sectoral composition of the GDP in the three cities in 2004 is presented in Table 9:

Table 9
Sectoral Composition of GDP, 2004, %s

	National Average	Harbin	Daqing	Qiqihar
Farming	12.2%	16.4%	3.2%	23.3%
Industry	50.2%	38.3%	84.9%	36.9%
Services	37.6%	45.3%	12.2%	39.8%

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005, NBS: Beijing

Once again Daqing presents an anomaly: an overwhelming percentage (85%) of its GDP is accounted for by one activity, oil extraction, which raises the issue of the future of the city; as the oil production has been falling and is forecast to fall to zero in 15 or 20 years. In both Harbin and Qiqihar the share of farming in their respective GDP exceeds the share of farming in the national GDP. In Qiqihar the share of farming is almost double the national share. The composition of GDP in Harbin and Qiqihar point to the importance of farming in Heilongjiang, where the ratio of cultivable land to population is high.

Sectoral Distribution of the Labor Force

The sectoral distribution of the labor force for the years 2004 and for 2005 are presented in Table 10:

Table 10
Sectoral Distribution of the Labor Force, 2004; 2005 %s

	Harbin	Daqing	Qiqihar
Farming	36%; 34%	44%; 38%	58%; 55%
Industry	29%; 28%	26%; 26%	16%; 16%
Services	35%; 38%	30%; 36%	26%; 29%

Source: National Bureau of Statistics (2005 & 2006): Heilongjiang Statistical Yearbook 2005 & 2006, NBS: Beijing

The notable feature of the table is the large change in the distribution within a short span of one year. All three cities have seen a substantial reduction in the employment share of farming and a commensurate rise in the share of the services. Except for that in Harbin, industry's share has remained constant. The most likely cause of the decline in the share of farming is increased competition from imported farm produce as a result of China's entry in the WTO. This has a particular importance for Heilongjiang because a comparatively large percentage of its labour force is employed in farming: 48.4% compared to the national average of 44.8%. Focusing on the distribution for 2005 in Table 10, one notable feature is that in Qiqihar as high as 55% of its labour force is employed in farming.

Referring back to Tables 4, in all three cities the farm share of employment in 2004 falls well short of the population resident in rural counties, 36% compared with 60% in Harbin, 44% compared with 54% in Daqing and 58% compared with 75% in Qiqihar. At 24 percentage points, the difference is particularly wide in Harbin. This corroborates the common observation that a

significant percentage of the labour force in rural counties is not employed in farming, and in terms of usual criteria some of the rural counties are only "rural" in name.

Referring to Table 5, in all three cities the percentage of the labour force employed in farming is significantly less than the percentage of the population classified as "agricultural". Reinforcing the point made in the previous paragraph, the conclusion that a substantial percentage of the population is mis-classified as "agricultural" when draws its income from non-farm activities.

Spatial Distribution of City's GDP

The spatial distribution of city GDP between rural counties and urban districts is given by Table 11:

Table 11
Spatial Distribution of City GDP, 2004, %s

	Harbin	Daqing	Qiqihar
Rural Counties	36	6%	52%
Urban Districts	64%	94%	48%

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005, NBS: Beijing

Setting Daqing aside as a special case of a city dominated by oil industry, the notable point about the above table is that the share of GDP originating in rural counties is twice the share of farming in GDP (Table 8). The implication is that non-farm activities account for over half of GDP originating in the rural counties of Harbin and Qiqihar and slightly less than half in those of Daqing. The general conclusion is that a significant percentage of the labour force and population are classified as "agricultural" even though it is not engaged in farming.

Public Finances

Tables 12 and 13 respectively present the figures on city's revenue and expenditure. As the cities vary widely in population, the figures are presented on the per capita basis. Taking city revenue first, Table 12 presents the figures for the whole city and city districts and rural counties taken separately:

Table 12
City Revenue per Capita, Rmb per year, 2004

Harbin			Daqing			Qiqihar		
Combined	**Urban Districts**	**Rural counties**	**Combined**	**Urban Districts**	**Rural counties**	**Combined**	**Urban Districts**	**Rural counties**
985	2,130	212	1,682	3,394	210	251	782	85

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005, NBS: Beijing

There are two notable features of the data in Table 12: first, a wide variation in the revenue of the cities, districts and counties combined and, a huge difference in the revenue per capita between urban districts and rural counties. Even neglecting Daqing, the ratio of revenue per capita in urban districts to that in rural counties is 8.5 in Qiqihar and 9.9 in Harbin. These differences are huge and matter because transfers from higher to lower government tiers are limited. As shown below, lower revenue per capita implies a lower expenditure on social security and on education and public health.

To bring out the scale of transfers and their impact on government services, Table 13 provides figures on expenditure per head for the whole city and urban districts and rural counties. Formally, sub-national governments are not allowed to borrow. But they do so indirectly by setting up companies. The figures in Table 13 are based on the assumption that any excess of expenditure over revenue is financed by transfers from higher government tiers.

Table 13
City Expenditure per Capita, Rmb per year, 2004

Harbin			Daqing			Qiqihar		
Combined	**Urban Districts**	**Rural counties**	**Combined**	**Urban Districts**	**Rural counties**	**Combined**	**Urban Districts**	**Rural counties**
1,550	2,813	684	1,914	3,605	461	706	1,223	526

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005, NBS: Beijing

There are two features of Table 13 that need to be noted. In all cases, expenditure per capita is higher than the corresponding revenue per capita, generally by a wide margin, which indicates a substantial transfer from higher government tiers (provinces and the central government). But significant differences still remain. To obtain a numerical estimate of the difference the transfers from higher government tiers make, Table 14 presents the coefficient of variation (standard deviation/mean) for per capita revenue and expenditure:

Table 14
Coefficient of Variation, per capita City Revenue & Expenditure, 2004

	Revenue	**Expenditure**
Urban Districts (Harbin, Daqing & Qiqihar)	0.52	0.39
Rural Counties	0.35	0.17

In Table 14 the coefficient of variation for expenditure, which includes transfers, is significantly lower than that for revenue: 25% lower in the case of urban districts and 52% lower in the case of rural counties. The conclusion is that transfers reduce inequality in government expenditure, and do so by a substantial margin. However, as shown below, notwithstanding the reduction, substantial differences expenditure on social security and education remain.

4. Social Protection and Security

4.1. Social Welfare Role of City Governments

At the outset of the reforms in 1978, whilst economic decision-making such as that concerning output and prices was centralised in government departments the provision of social services and collective goods and the operation of social security schemes in urban areas were dispersed across a large number of work units. Financing and operating social security schemes that now constitute a major component of the tasks of city governments were their minor concerns. Running and establishing enterprises constituted much of their business. As well as producing goods or services, enterprises also provided either free or at low prices a wide range of services to their current and retired employees and often their families as well. Prominent amongst these have been housing, in- and out-patient medical treatment, schooling for children and in some cases even public utilities. The extended social welfare role of enterprises, which was copied from ex-

Soviet Union, was of special importance in North-East. Even today in Harbin and Qiqihar a significant percentage of school places are in enterprise-based schools.

Broadly, the transition to a market economy has reversed the inherited pattern by decentralising economic decision-making to enterprises and centralising the financing and administration of social security schemes in government departments. Much of this change has taken place at the city level. This change of roles has been complicated by the fact that the city governments, which now carry the principal responsibility for financing and operating social security schemes, lacked the ready capacity to take on the welfare role of enterprises. Pre-empted by the extensive social role of work units, government provision of social services tended to be sparse, largely for government employees. In turn, enterprises, not having been created on the basis of financial viability or "naturally selected" for survival in a market economy, could not operate as independent financial units.

A social security system with its own administration, regular sources of finance and separated from the organisation of economic activity is largely a development from the second half of the 1990s, one that is still under way and has huge ramifications for the role and functions of city governments. The city Bureaux of Labour and Social Security, which are the mainstays of contributory social security schemes, began to be established only in 1998. In the pre-1978 period income maintenance was woven into the fabric of economic organisation. Those able to work were, if urban inhabitants sooner provided with a job or, if rural residents assigned a remunerative task in the collective economic organisation of which they were a part. The payment of an allowance in cash and kind was confined to a very small group unable to work. This was the planned economy version of "welfare through work" or workfare. Employees of the state sector and larger collective enterprises, constituting most of the urban labour force, were covered by Labour Insurance, the precursor of the present-day Social Insurance. This was financed and administered by work units (*danwei*) - including enterprises, social service units (*shiye danwei*) and government departments, not by the city Labour Bureaux.

The social security schemes city governments organise and operate divide into the familiar categories of "social insurance" and "social assistance (social safety net)". In the former entitlement to benefits depends on the contribution record. Following the system overhaul in the late 1990s, the Chinese Social Insurance schemes are financed from three sources: employer and employee contributions and the government budget[2]. Employee contribution is a recent innovation, dating from the second half of the 1990s. The contributions are meant to cover most if not all of the cost of the scheme, excluding the cost of administration. The government serves as the "financier of the last resort", i.e. responsible for covering any shortfall of contributions from outlays. For the most part, this role falls to city governments.

The introduction of a government contribution towards Social Insurance, rather than being a novelty, simply formalises what has implicitly been the case. City governments have long subsidised old-age pensions and health care expenditure of loss-making enterprises in their charge. The principal problem in the government financing of urban social security is that it takes place at the level of city governments. As exemplified by Harbin, Daqing and Qiqihar (see

[2]. Responding to the widespread practice of over-charging the social security funds, the Ministry of Finance banned in 1998 the charging of administration cost to the social insurance contribution.

Tables 11, 12 and 13), the fiscal capacity of city governments varies very widely and a system of fiscal transfers to so as eliminate large differences in the provision of essential public goods and services remains yet to be worked out and implemented. For the most part, this responsibility falls to 262 or so above county-level cities, an arrangement that neither provides sufficient risk pooling nor is equitable. The pooling of social security contributions and expenditure at the provincial level is the professed policy aim and being piloted in three North-Eastern provinces. But thus far only Jilin has achieved the aim and Liaoning and Heilongjiang have yet to do so.
Social Insurance covers old-age pension, medical insurance, unemployment benefit, work injury compensation and maternity benefit. Instead of being treated as a package, they are treated as separable, between which participants can pick and choose. The number of participants varies across schemes, as shown by Table 15

Table 15
Participants in Social Insurance Schemes, 2006

	Harbin*	Daqing	Qiqihar
Old-age pension	1,070,000	248,145	336,020
Medical Insurance	1,628,000	260,000	627,000
Unemployment Insurance	1,010,000	176,739	481,000
Work Injury Compensation	422,000	104,000	163,000
Maternity Benefit	350,000	91,000	NA

* 2005 Figures

Picking and choosing between schemes amounts to what in insurance literature is termed as "adverse selection", i.e. whereby lower risk individuals opt out and thus raising the riskiness of the scheme, which may either reduce the benefits or raise the cost of the scheme. It goes against the spirit of "social insurance". The reason for this odd feature is that the schemes were not instituted at the same time but on a piecemeal basis. The old age pension scheme dates back to the 1950s. In contrast, the unemployment insurance scheme (established in 1986) and the medical insurance scheme in its present form (instituted in 1998) are recent developments.

Historically, social insurance has been closely tied to formal wage employment. Participants have mostly been urban residents in formal employment, so called *zhigongren*, predominantly state sector employees. With reduction in the labour force in the state sector since the mid 1990s, the number of such employees has fallen posing the challenge of extending Social Insurance to the informally employed. Participation in the Social Insurance schemes is mandatory for the urban labour force but the actual participation rate fall well short of 100%. For example in Harbin in 2005 no more than 76% of the urban labour force participated in the medical insurance scheme, the scheme with a higher number of participants than those in other schemes. The actual percentage may be much lower because the participant numbers given in Table 15 above also include migrants, who are not counted as part of the urban labour force. Participation of migrants in the Social Insurance schemes is not mandatory, though some participate on a piecemeal basis though many localities now enrol migrant workers.

Social Insurance provides a limited social security cover in that it not only excludes by design the non-participants in the labour market but also fails to extend to the whole urban labour force. The implication is that a social security system has to include both social insurance and social assistance schemes, if it is to cover a substantial section of the population, which is the trend of

recent developments in the social security system. The transition towards a market economy has drastically curtailed the scope of "welfare through work" and the void that created has been largely filled by social assistance (means-test) schemes. Being non-contributory the social assistance schemes have to be financed from general government revenue, which, in the Chinese context, leads on to the vexed issue of the apportionment of expenditure responsibilities among various government tiers. The issue has risen in importance in recent years with the establishment of a number of new social assistance schemes and a huge growth in the number of their beneficiaries. Prominent examples include two schemes. One is the Minimum Living Standard Allowance (MLSA), which was set up at the end of 1997 and the number of its beneficiaries has risen from 1.8 m in 1998 to 22.3 million in 2005. The other is the new Rural Cooperative Medical Insurance Schemes (RCMIS), which began to be set up in 2003, are heavily subsidised and cover a rural population of over 100 million. The dramatic increase in the number of beneficiaries of these two schemes is due largely to the central government covering most of the cost of the schemes and thus circumventing the issue of the division of costs between government tiers.

4.2. Two Salient Features of the Social Security schemes

Taken together the Social Insurance and social assistance schemes are characterised by two salient features, ramifications of which run wide and deep through Chinese cities

- Segmentation and striking differences in provision across groups;
- highly decentralized financing and management;

Segmentation

In Harbin, Daqing and Qiqihar, as in other Chinese cities, all social security schemes are earmarked either for the urban or the rural population; as yet, there is none that covers the whole population. "Rural" and "urban" are defined with reference to the entry in the *hukou,* not the actual place of residence. As a result persons living and working in cities on a long-term basis may still be classified as "rural" and excluded from the schemes for the urban population. Referring back to Table 6 above, between 21 to 23.5% of the population in the city districts being classified as non-agricultural are excluded from the social security cover their fellow residents enjoy.

The difference in the social security provision for the urban and for the rural population is glaring. In principle, though not always in practice, those with bona fide urban registrations benefit from a complementary combination of a comprehensive Social Insurance and the MLSA, which bridges any shortfall of household per capita income up to the local poverty line. As a result, the urban population enjoys a comparatively high level of social security by the standards of developing economies. In contrast, social security provision in rural areas is sparse, designed to relieve acute poverty only.

There are two professed rationales for the limited social protection cover in China's rural areas. One is that each rural household is assigned a plot of agricultural land that serves as a floor to household income, a feature that is particular to China and a few other economies. The other is the high cost of introducing a social security regime comparable to the one in urban areas relative to the limited capacity to collect taxes and social security contributions in rural areas. Both are

valid justifications, but under strong qualifications. The protection provided by land plots is highly variable and has diminished over time because of the combination of the increase in the rural population and the diversion of land to non-farm uses. The latter has given rise to a substantial rural population without any land. As for the second, the rural-urban distinction is maintained even where it is possible to extend some schemes to the rural population. For example, For example the percentage of the rural labour force engaged in non-farm activities is 37% in Harbin, 25%in Daqing and 21% in Qiqihar.

How wide is the difference in the social security provision between urban and rural population? To answer this question, Table 16 presents expenditure per capita on social security and subsidies, including one-off relief, in the urban districts and rural counties of Harbin, Daqing and Qiqihar.

Table 16
Per Capita Expenditure on Social Assistance and Subsidies, 2004

	Districts	**Rural Counties (% of Districts)**
Harbin	310.1	64.1 (21%)
Daqing	145.8	34.8 (24%)
Qiqihar	432.0	71.3 (17%)

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005, NBS: Beijing

The per capita expenditure in rural counties ranges between 17 to 24% of that in the city districts of the same city. Price difference accounts for a very small part of the difference. Most of the difference is due to the fact that the rural population is excluded from some schemes that cover the urban population or the benefit level for the rural population is substantially lower than that for the urban population when both are covered by a similar schemes. Both these possibilities are exemplified by the Minimum Living Standard Assistance (MLSA), which is discussed below. The gap between urban districts and rural counties is not confined to social assistance. Though not as huge, a significant gap also exists in expenditure on education, as shown by Table 17.

Table 17
Per Capita Expenditure on Education, 2004

Harbin		**Daqing**		**Qiqihar**	
Urban	Rural (% of Urban)	Urban	Rural (% of Urban)	Urban	Rural (% of Urban)
345	198 (57%)	162	146 (90%)	234	184 (79%)

Source: National Bureau of Statistics (2005): China City Statistical Yearbook 2005, NBS: Beijing

Here, education expenditure covers expenditure on all levels of education from primary to tertiary; a part of the difference is due to the difference in the composition of expenditure, e.g. a higher share of expenditure on tertiary education in urban districts than in rural counties. However, subsidy per pupil for basic schooling is higher in urban than rural areas.

Decentralization

Both rural and urban social security systems are highly decentralized, the former more than the latter. In the case of the urban schemes, although Social Insurance and MLSA are based on regulations issued by the central government, many of the details of the schemes are left to the discretion of the provincial or municipal governments. More consequential, for both Social Insurance and social assistance the budgetary units are 269 cities (excluding county-level cities and towns); and generally cities are expected to cover from their own budgets any deficit. As is to be expected, the balance between contributions and expenditure varies across cities, depending on the number of pensioners relative to contributors and the unemployment rate, and so do their general finances. As a result, the operation and benefit levels can vary widely across cities even within the same province. Apart from a few very large ones, cities are too small a budgetary unit to provide sufficient risk pooling to ensure the sustainability of Social Insurance.

Decentralization in rural areas runs deeper than in urban areas. Apart from a few schemes run by the national or by provincial governments, most of the rural social security schemes are organised at the grass roots level of villages. Such schemes include assistance to poor households and the rural pensions and cooperative medical insurance schemes. The initiation, operation and financing of rural schemes largely rest with lower tier governments; the higher government tiers (provinces and the centre) confine themselves to the supervision and setting-up of pilot schemes. Associated with this, variations in social security provision are much wider in rural than in urban areas.

A pooling of Social Insurance contributions and expenditures at the provincial level is the policy aim. In most cases, this would be sufficient to put the urban social security system on a sound financial footing because many of the Chinese provinces are as populous as sizeable countries. The upgrading of the level of budgeting from cities to provinces for Social Insurance can take a number of forms ranging from a full integration to compensatory transfers within a decentralized system. Each of these has implications for the administrative structure, as well as for equity. Thus a choice between options concerning financing raises the important issues of the appropriate degree of decentralisation in administration and of how to counteract the incentive for the cities reduce effort in collecting contributions arising from a sharing of expenditure. The problem is real in the Chinese context because of the decentralised administration of social security schemes. An upgrading of the level of budgeting from cities to provinces would necessitate some degree of centralisation of the administrative framework.

The pilot program for “improving urban social security”, initially launched in Liaoning province and then extended to the other two North-Eastern provinces (Jilin and Heilongjiang), aims to raise the level of budgeting from cities to provinces, but only for the pension scheme, which is by far the largest scheme in terms of expenditure. As yet, the aim has been realised in Jilin province, the smallest of the three North-Eastern provinces

5. Poverty – Incidence and Alleviation

Poverty refers to deprivation or a shortfall in meeting basic needs. It is generally understood to be caused by lack of adequate income or assets and is conventionally measured with reference to either expenditure or income required for meeting basic needs. The income/expenditure indicator of poverty is the most important and an essential first step in the analysis of poverty regardless of the particular approach to poverty. But it is now generally accepted that the living standard and thus poverty is a multi-dimensional notion that is only imperfectly captured by a poverty line in terms of measured expenditure/income. There are two factors that introduce an ambiguity in the relation between the satisfaction of basic needs and income/expenditure. First, basic needs vary with individuals or households. For example, for individuals suffering from a chronic illness the need for medical care is of different order of magnitude from that for healthy individuals. By its very nature, a poverty line glosses over differences in basic needs across individuals and refers to a representative individual. Second, access to goods and services required for satisfying basic needs depends not only on income/expenditure but on other factors as well. For example, in Chinese cities migrants do not enjoy the same access to, for example, housing and schooling as registered residents do.

In sum, the dimensions of living standard or well-being are not only numerous but also several important ones among these are imperfectly captured by income/expenditure or not at all. Poverty measured solely by level of income/expenditure inadequately covers, to give a few examples, freedom from avoidable illnesses, literacy, the availability of clean and sufficient water, decent housing and a healthy physical environment. Therefore it is important to complement the estimates of poverty on deprivation in specific respects such as housing, public utilities and the physical environment.

5.1. Urban Poverty

Until the beginning of the 1990s, poverty in China was regarded as a largely rural phenomenon. Urban poverty was believed to be confined to the small section of the urban population characterised by so-called "three nos": no ability to work, no savings or other income source and no relatives to depend on. The able-bodied did not qualify for poverty relief; they were obliged to work and the government was under obligation to provide them with a job, albeit at a very low pay. But since the middle-1990s urban poverty has come to be seen as a problem that potentially threatens a substantial percentage of the urban population. There three salient differences between the "old" and the "new" urban poor:

- The "new urban poor" are larger in numbers than the "old urban poor".
- The emergence of new urban poverty has gone in tandem with rising inequality in urban areas. The contrast between “haves” and “haves not” is starker than ever before in PRC’s history.
- Unlike with the "old urban poor", a large percentage of the “new urban poor" are able and willing to work but have no jobs.

The first two are related. The rise in urban poverty is due partly to a changing perception of poverty. Urban poverty, which in the past was barely distinguishable from the then prevalent

living standard, now stands out against the background of a comparatively high and rising average living standard. The third is the distinguishing feature of "new urban poverty" that reflects a fundamental change in the urban economic environment, especially from 1994. The state and collective sector, traditionally the main source of employment for the urban labour force, has been losing jobs. In just five years from 2000 to 2005 the state sector in Heilongjiang has lost 1.4 million jobs, 33.3% of the total in 2000. The non-public sector has been creating new jobs but not in sufficient numbers to offset job losses.

5.2. Minimum Living Standard Assistance for Urban Residents

The Minimum Living Standard Assistance (MLSA) is a recent addition to the social security package for the urban population that includes social insurance. The scheme provides the second line of defence against urban poverty. The first is the unemployment insurance scheme, which covers only a part of the urban population and only subject to the contribution condition.

Instead of being instituted from the top by the central government, as unemployment insurance was, the MLSA began as a local initiative in 1993 when Shanghai introduced a minimum living standard scheme for its non-agricultural population. The development sequence of the MLSA is very similar to that of numerous reforms since 1979. That is, to begin with experiment in selected localities followed by extension and finally universalization across the country and formalization through laws and regulation. In 1998 the State Council made it mandatory for all cities to set up a MLSA scheme for their urban citizens. The set-up dates of the MLSA for the three cities are as follows (Table 18)

Table 18
Set –up Dates of MLSA

Harbin	1997
Daqing	1996
Qiqihar	1999

Both Harbin and Daqing introduced the scheme before it was made mandatory, the latter well before. Qiqihar introduced the scheme after a delay because of its relatively strained fiscal position, see Table 12 above.

The predominant component of the MLSA is a cash allowance equal to the difference between the current household per capita income and the local poverty line that, in principle, is sufficient to cover basic needs. Four aspects of the assistance are of significance and worth noting:

- Eligibility
- Unit of calculation
- Adjustment for the size and age composition of the household and its special circumstances
- Implications for the incentive to engage in paid employment

According to the State Council regulation issued on 1 October 1999, subject to "non-agricultural" *hukou*, all individuals with a household per capita income below the local poverty line are eligible for assistance under the MLSA. Though common in many countries, this eligibility condition marks an important change in the context of urban poverty alleviation in China because it is specified in terms of income not, as in the past, in terms of personal attributes such as ability to work and the family circumstances. In contrast to the earlier form of urban

poverty relief, assistance under the MLSA is also available to those able to work with a household income below the local poverty line, at least in principle if not always in practice. In this respect, the scheme marks an important change by loosening the close link between work and welfare that existed over much of the planning period and, in practice, up to the beginning of the 1990s. The development of a market economy has made "assistance through provision of a job" increasingly impractical, especially in the second half 1990s with the mounting pressure on state and urban collective enterprises to reduce labour. The definition of eligibility for assistance in terms of income recognizes the inability of the local government to provide a job guarantee and thus represents acceptance of the inevitability of labour lay-offs as a consequence of a restructuring of the state sector.

For the purposes of the MLSA, poverty is measured with reference to the combined income of the household on the assumption that income is shared according to need among household members. This is a common procedure in means-tested and non-contributory social security programs in most countries. In contrast to MLSA assistance, unemployment insurance benefit is paid to individuals without a job regardless of their family income, as long as they have the requisite contribution record. As a result, the section of the population that qualifies for MLSA assistance does not fully coincide with the section that is entitled to the unemployment benefit. In particular, MLSA assistance may be payable to a household of which none of the members qualifies for unemployment insurance. In such cases, which are increasingly common, the MLSA caters for the section of the population that is bypassed by unemployment insurance. Moreover, a household with all its working age members receiving the unemployment insurance benefit may be eligible for the MLSA assistance because of its dependent members. In such cases the MLSA serves as the supplement to social security schemes that do not take into account recipients' households. In the Chinese context this holds for all income maintenance schemes under social insurance, including old-age pension and disability compensation as well as unemployment benefit.

The MLSA simply makes up the difference between the poverty line and the household per capita income. The actual MLSA benefit per recipient is generally low, a fraction of the local poverty line. The poverty lines and average payment per recipient in the three cities are presented in Table 19.

Table 19
Poverty Lines & Average Cash Allowance per Recipient, Rmb/month

	Poverty Line (% of Average Urban Wage)	**Cash Allowance**
Harbin	200 (16%)	57
Daqing	195 (19%)	67
Qiqihar	165 (8%)	70

To provide a benchmark for assessment, the poverty lines are expressed as a percentage of the average monthly wage rate in urban districts. There are two notable points about the percentages. First, the percentages are low, 19% being the highest. Second, referring back Table 12 and 13,

Daqing with the highest poverty line relative to wage rate also has the highest urban revenue and expenditure per capita and similarly Qiqihar with the lowest poverty line also has the lowest urban revenue and expenditure per capita. The implication is that the poverty line not only reflects the cost of obtaining basic necessities but also the state of the public finances of the city that finances the MLSA. This suggests the need for raising the level of the government at which the MLSA is financed.

In addition to the cash allowance, the recipients receive subsidies to cater for a wide range of specific needs, including for the following:

- Housing benefit when in sub-standard housing
- Heating allowance
- School fee remission and free text books
- Part subsidisation of medical care cost

Since the institution of the MLSA countrywide, the number of specific subsidies has multiplied, which suggests two points. First, the cash allowance does not cover the basic needs adequately as it should do; and these specific subsidies compensate for the inadequacy of cash allowance. Second, specific allowances point to multi-dimensional nature of poverty and, correlated with that, the inadequacy of poverty alleviation through a cash allowance.
The poverty line is determined so that the following relationship holds (Table 20)

Table 20

Local Minimum Wage > Unemployment Insurance >Poverty Line

The 1995 Labour Law mandates local government to set a minimum wage for the locality taking account of the local labour market, the living standard and prices. Thus the minimum wage is similar to a poverty line that sets an upper bound to various social security benefits. The above ordering preserves the incentive to take up employment at the minimum wage. But it leaves open the possibility that the local poverty line may be too low to prevent severe hardship, especially in cities with high rates of unemployment.

The number of recipients of MLSA in the three cities is presented in Table 21

Table 21
Number of MLSA Recipients, 2005

	No. of Recipients (% of non-agricultural Population)
Harbin	207,000 (4.4%)
Daqing	57,701 (4.6%)
Qiqihar	162,000 (8.3%)

The percentage of the population with non-agricultural registration receiving MLSA is almost twice as high in Qiqihar as in Harbin and Daqing. How do these numbers compare with the national average? In 2004, the nationwide total of MLSA recipients was 22 million which was

6.1% of the total population with "non-agricultural registration", a percentage lower than that in Qiqihar but higher than those in Harbin and Daqing.

Turning to financing, the 1997 and 1999 State Council regulations that underpin the MLSA mandate city governments to establish an MLSA financed from the local budget. City governments are required to set aside sufficient funds to meet their MLSA obligations. To prevent misuse, these funds are required to be deposited in a special account. The financing arrangement whereby each city is responsible for is too decentralized to ensure the sustainability of the MLSA. In particular, it implies an onerous burden on cities caught between the scissors of a strained budget due to deterioration in the financial condition of local enterprises, on the one hand, and a high unemployment rate on the other. However, in practice the cost of the MLSA, instead of being borne entirely by city governments, is split between government tiers, with the central government contributing a major share.

Without cost sharing, MLSA would not have become a country-wide scheme and grown rapidly in terms of the number of beneficiaries. However, the financing arrangement suffers from two major defects. First, it is make-shift. Second, it is inequitable. All tiers of the government, from the centre down to urban districts share in the cost. For example, Harbin's 8 city districts shoulder as high as 40% of the cost of the MLSA. City districts are too small a unit to spread the cost. The percentage of the poor is not evenly distributed but varies widely across districts of a city. Added to this, districts with a higher percentage of the poor also tend to have more strained public finances.

5.3. MLSA for the Rural Population

All three cities introduced the rural MLSA in 2006. While Harbin and Daqing use ¥ 682 per year as the poverty line, Qiqihar uses the lower poverty line of ¥ 627 per year. These are respectively the lower and the higher lines used to estimate the official rural poverty rate. To give an idea of how these lines compare with the prevalent living standard, ¥ 682 is around a third of the average consumption per capita in rural areas in Harbin and Daqing and ¥ 627 is 38% of that in Qiqihar[3]. The rural MLSA is not entirely new, instead a replacement for various poverty alleviation schemes targeted at particular groups. The scheme raises the effectiveness of poverty alleviation by removing blind spots created by narrowly targeted schemes. The reason is that, unlike the poverty alleviation scheme it replaced, rural MLSA covers everyone in the purview of the scheme with an income below the local poverty line. The rural MLSA is as yet not mandatory; it is encouraged but only in richer localities. Though the State Council has recently decided to extend the rural MLSA to all provinces by the end of 2007[4]. The financing arrangements for both rural and urban MLSA are not settled. They can vary across localities and across schemes. On a case-by- case basis the higher government tiers contribute. But there is as yet no regular framework for the sharing in the cost by government tiers.

[3] The figures for average consumption per capita in rural areas are from: National Bureau of Statistics (2005): China Statistical Yearbook for Regional Economy 2005, NBS: Beijing

[4] People's Daily Online 19 January 2007.

3. Urban Environment and Services Review for Northeast China (Heilongjiang Province)

C. Lotti & Associati S.p.A. – Mott Macdonald Ltd.[5]

Objective and scope of the report: This study "Urban Environment Review" (UER) was funded by the Italian Consultant Trust Fund at the World Bank. It was prepared by the Joint Venture between the international consultant companies C. Lotti & Associati and Mott MacDonald Ltd.

The study covers the cities of Harbin, Qiqihar, Daqing and Mudanjiang which are in Heilongjiang Province. The objectives of the assignment are summarised as follows:

- Review the urban environmental issues
- Analytically review the strategy and plans
- Assess the short and medium plans for environmental investment plans
- Explore the range of financing and assistance options

The cities of Harbin, Qiqihar and Daqing are part of the "economic corridor", an area that the provincial government is keen to develop into an integrated productive unit. Planning horizons in this study are set at the years 2010 and 2020. The former coincides with the end of the 11th five year plan (11 FYP).

The four project cities are located in the Songhua river basin. Although the cities under consideration are all in Heilongjiang province certain issues – in particular water resources and water quality can only be analysed at a river basin level thus the project must consider interactions throughout the Songhua river basin which extends beyond Heilongjiang into Jilin and Inner Mongolia Provinces. The population of Heilongjiang is around 40 million while that of the Songhua basin is around 65 million.

Harbin is located downstream of the confluence of the Nen River and Second Songhua River which together form the Songhua mainstream. Two project cities, Qiqihar and Daqing are on the eastern side of the Nen river basin, upstream of Harbin. Both therefore have an influence on water pollution and water quality in Harbin. However Qiqihar is located on the banks of the river Nen while Daqing is more than 100 km from the main channel, connected through the complex network of rivers and lakes on the Nen Plain. Mudanjiang is on the Mudan river, which flows south north through more mountainous country and is a tributary of the Songhua mainstream river, joining some 400 km downstream of Harbin. Details of the total and urban areas are shown below.

The climate of the study area is marked by cold dry winters and warm summers. Yearly rainfall is moderate with an average of 513 mm year in Harbin and 600 mm in Qiqhiar. Wettest months are in June July and August during which 70 to 90% of annual rain falls. The Songhua River has large floods mainly from summer rains rather than snowmelt.

[5] C. Lotti & Associati S.p.A.http://www.lottiassociati.com/eng/index.htm#; Mott Macdonald Ltd. http://www.mottmac.com/

Socio-economic context: Heilongjiang's gross domestic product (GDP) substantially increased in the past several decades with industry and manufacturing contributing a large proportion of this growth, though it is growing less quickly than the southern provinces of China. The growth rate in agriculture is consistently lower than in services and industry.

Table 1 - Average 1980-2003

	Province	Harbin	Qiqihar	Mudan'	Daqing
GDP growth rate (in %)	9.2	9.0	11.0	8.7	5.1
GDP per capita (RMB)	9,349	17,325	7,393	11,178	47,667
% Share of agriculture in GDP	11.1	16.0	24.1	12.9	3.2
% Share of industry in GDP	59.5	36.6	36.5	42.4	84.6
% Share of services in GDP	29.4	47.2	39.4	44.7	12.2

In Heilongjiang Province, average urban income per capita increased from about 460 RMB in 1970 to about 13,000 RMB in 2004. Average per capita income in the four project cities does not deviate substantially from the average income in the province, with Harbin and Daqing having the highest.

Data on population projected to years 2010 and 2020 are illustrated in table 3 and the following figure.

Table 2 - Population in 2003 (In million) *(population already mentioned in intro – though data is consistent)*

	Province	Harbin	Qiqihar	Daqing	Mudan'
Population in prefecture	39	9.5	5.5	2.6	2.7
Urban population in urban area	18.6	4.0	1.4	1,2	0,8
Rural Population	20.4	5,5	4,1	1.4	1.9

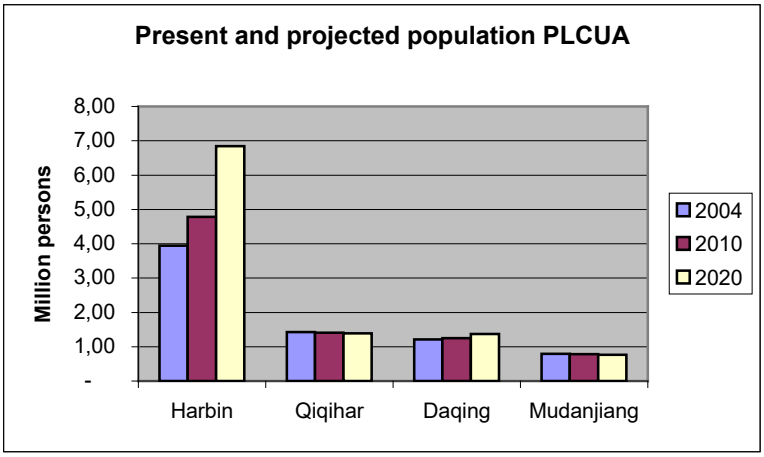

Figure 2 - Urban Populations in 2004 and projected for 2010 and 2020

The growth rate of the population in Heilongjiang followed similar patterns as the country as a whole, with population growth slowing down after 2000 to give overall growth rates of around 0.5%. The urban population in Harbin is projected to increase. The other cities show a substantially stable projected urban population and show a decline in rural population.

Water resources and demand:

Overall water resources per capita in the Songhua Basin are about average for China at 1876 m3 though this is still only about one fifth of the world average[6]. Consumption of water is 576 m3 available per capita each year. Thus 31% of the water resource available in the river basin is utilized by human activities, of this 40% is drawn from groundwater and 60% from surface water. 70% of the water used is for Agriculture, most of this (about 80%) will not be returned to the watercourse but lost to evaporation. 10% is used by industry and 20% by urban water supplies most of which will be returned to the water courses, though in a polluted form.

Because of the high seasonal variation in rainfall and runoff the water resource available during the winter is very low, however regulation of winter flows should improve with the completion of the Nierji reservoir upstream of Qiqihar in 2006. This will regulate flows on the Nen River; the Second Songhua is already regulated by reservoirs in Jilin.

Table 3 – Water sources and demand

City	Water source		2004	2010	2020
Harbin (low growth)	Songhua river & wells	Mm3/y	270,39	333,76	499,97
Harbin (high growth)	" & "	Mm3/y	270,39	402,59	638,24
Qiqihar	Nen river	Mm3/y	58,00	143,37	153,84
Daqing	Reservoirs & wells	Mm3/y	58,00	129,94	152,01
Mudanjiang	Mudan river	Mm3/y	36,40	143,53	154,18

Water demand is likely to increase in Harbin because of the projected increment in the urban population. In the other three cities, although the urban population will remain fairly stable the increase in income per capita is likely to generate an increase in consumption. Waste water production is essentially tied to the volumes of water produced and distributed.

Solid waste is currently formally collected and disposed only in the main urban areas.

Key environmental issues:

River pollution in Heilongjiang is a major cause for concern. In Harbin, the issue of drinking water safety has drawn extensive attention after a series of water pollution accidents occurred on the Songhua River. All of the cities depend heavily on surface water in an area marked by extensive point and non point pollution. The water quality in Mudanjiang is compromised by industrial discharges upstream in Jilin province. The Songhua has poor water quality much of the time but is especially vulnerable during the winter dry season when flows are low and the surface is covered by ice, greatly reducing self-purification processes. The cold temperatures also prevent the correct operation of biological wastewater treatment plants in winter. It is one of the only major rivers in China that continues to show a deteriorating trend of water quality standards.

Agriculture is generally considered as a source of diffuse pollution arising from the use of organic and inorganic fertilisers and pesticides on crops. In Heilongjiang the use of these is at similar high level to other provinces in China and is a significant source of pollution, particularly

[6] Based on MWR 2004 data published on MWR website

nutrients Nitrogen and phosphorous which case eutrophication of water bodies. However there is an increasing threat to water quality posed by point discharges from intensive animal raising facilities, the rapid development of which is being strongly encouraged in Heilongjiang.

Air quality: The most representative parameter of urban air pollution is PM_{10}, with Grade II air quality equalling 0.100 mg/m3. The average annual concentration in the urban areas of Harbin is 0.113 mg/m3. Reportedly, the use of coal for heating is a major factor in the high PM_{10} value. The planned extension of central heating will help in improving the air quality. The monitoring network needs to be extended in points and parameters.

Existing urban services: Water supply infrastructure is generally adequate to meet the current demand. To a certain extent this is truer for Harbin and Daqing, while Qiqihar and Mudanjiang have some suppressed demand. The weaknesses are:

- poor reliability of the water resource, particularly in terms of quality,
- technical capability which often fails to meet the required water quality standards;

Comparison of operational data with similar utilities shows an acceptable level of productivity. Water losses do not differ substantially from other similar services abroad though are high in some districts. However, by international standards the water utilities in the study area tend to be overstaffed. The operating cost of the marginal water quantity is much lower than the equivalent of the best international cases; this is most probably due to the low impact of labour over the operating expenses.

Waste Water: The principal concerns are;

- ✓ Wastewater collection only covers limited areas served by water supply;
- ✓ Wastewater treatment capacity is not adequate to meet in full the present demand;
- ✓ Sludge from WWTWs is not treated and disposed of in an appropriate way.

Domestic solid waste: MSW is collected daily from door to door. Waste is transported first to collection centres, from where waste is transported and disposed by landfill method. There are some landfill sites that are designed to international standards but most sites are not adequately engineered for permanent disposal. The capacity of the properly constructed landfill sites is much lower than the rate of generation as a result much of the waste is disposed of by dumping in inappropriate sites. Presently only the MSW generated in major urban areas is properly disposed of, rubbish in small towns and rural areas is incinerated in open piles or dumped inappropriately.

Special attention is being paid by the Provincial authorities to special and hazardous wastes and specific projects are planned. Though not yet implemented they seem likely to solve the issues.

Institutional arrangements: In Harbin, the Harbin Water Supply and Drainage Group Co., Ltd have been established. Presently this group of companies is under the direct administrative control of the municipal government and is a self-accounting enterprise with a high level of management skill.

In Qiqihar a UDIC has been formed to undertake the investment, financing, construction, operation and management of urban infrastructure and utility projects, manage the existing assets, implement the investment and administer projects. In Mudanjiang the Water Supply Company and Drainage Company were transferred from the Water Administration Bureau to a UDIC and the Water Administration Bureau in now only providing regulatory guidance and administration.

The following Table 4 summarizes the values of the fees charged at the beginning of 2006.

Table 4 - Tariffs in water and urban services (RMB/m3 or RMB/t)

No.	*Tariff Type*	*Harbin*	*Qiqihar*	*Daqing*	*Mudanjiang*
1	Domestic Water Supply	*2.40*	*1.75*	*1.50*	*1.92*
2	Industrial water Supply	*4.50*	*2.50*	*1.80-4.00*	*2.36*
3	Commercial Water supply	*5.00*	-	*3.0-7.0*	-
5	Waste water Fee	-	-	*domestic: 0.50* *Non domestic: 0.90*	-
6	Solid Waste Fee	*2.70*	*domestic: 0.50/pc/m* *Productive Units: 1000/m*	*2.00-3.00/m²/y*	0.50/pc /m

Analysis and strategies for environmental services: This study focuses on the projects related to environment and urban services that are an important component of the whole 11 FYP. It is noted that at early April 2006 only the projects related to Harbin were approved at provincial level. In the other three cities the list of projects was still in progress.

Table 5 - 11FYP Investment cost related to urban services by city and by sector (Mill RMB)

Sector/City	Harbin	Qiqihar	Daqing	Mudanjiang	Total
Water supply	2,623	1,071		1,946	5,641
Waste water collection and treatment	1,937 3,381	2,451 1,339 (plus collection only)	170	293	4,852
Solid waste collection and disposal	1,496	1,317	170	139	2,953
Other environment related projects			170		170
subtotal	6,057	4,840	340	2,378	13,617

An analysis of future status and planned capacity shows the following:

Water Supply:

Harbin: With the completion of the Mopanshan scheme, the resulting total capacity of some 2 million m3/d should be able to sustain the projected demand of the service area until 2020, including perhaps a substantial extension of the served population. The implementation of Mopashan scheme is likely to half the risk on the water supply due to possible contamination of the main source, the Songhua river.

Qiqihar: the current capacity is barely adequate to meet the present requirements and the planned additional capacity is just enough for the next time horizon.

In areas leakage is very high, reducing this to economic levels could help meet capacity requirements.

Daqing: there is an apparent surplus of capacity that is understood to be provided by the local industry.

Mudanjiang: The capacity of the water supply is adequate to meet the current demand but the planned additional capacity is does not appear to be adequate to cope with the projected demand at 2020.

In Qiqihar and Mudanjiang to meet the future demand additional investments would be needed in the order of 15-18 million RMB respectively.

Wastewater:

On the basis of preliminary water quality modelling, the following conclusions have been reached;

1. The current rate of investment in WWTW in NE China is nearly but not quite keeping pace with the rate of deterioration in water quality due to population and economic growth.
2. The projects proposed for completion by 2010, if all were constructed and operated at full capacity will just about maintain water quality. Operating the existing works to full capacity will result in a slight improvement.
3. Ignoring improvements in industrial, livestock and agricultural pollution management, unless there is major investment in municipal wastewater management up to 2020, in the order of 30 billion RMB the water quality will deteriorate further.
4. Discharges from livestock are likely to be a major contributor to the poor water quality. Reducing these discharges – or at least preventing increases could make a significant contribution to improving water quality and may be achievable at lower cost than municipal and industrial treatment.

Solid Waste Disposal Sector:

The project currently envisaged look adequate in size and extension to cope with the projected demand in most of the project area, with the possible exception of Harbin. The demand is likely to grow substantially in the near future and the cities should be encouraged in implementing bigger schemes and newer technologies. At provincial level incinerators and treatment for special wastes should have a priority for they serve a wide area.

4. Priority Needs for Ha-Da-Qi Corridor Development

The World Bank

The CDS work focused on specific issue sets in each of the three cities (Extended Urban Regions/EURs and the Corridor). This is because of limited funding, the fact that local governments have identified the priority areas they wished to see addressed, and the need to focus on a few strategic thrusts for the program to add concrete value and be successful.

Vision Statements

Visioning techniques and development of Vision statements are an important component of the work in all four spatial areas, as requested by the Provincial governments. The Vision statements act as organizing principles for short and medium term development in the context of longer-term priority principles, objectives, and targets reflected in the Vision.

The Ha-Da-Qi Corridor

CDS Work on the Ha-Da-Qi Corridor focused on the following:

(i) Diagnosis of the underlying potential of the Corridor as an agent of re-structuring and economic development. At present the Corridor Plan is static, indicating economic pillars by the 15 nodes (essentially existing economic and high tech zones – the number of nodes is to expand to 22 by 2020). What is needed is an understanding of potential economic complementarities among places, flows, potentials for deepening clusters and enabling new activities (including start-ups), etc. An essential question is: "what types of economic activity is possible in trying to move up the value chain as much and as fast as possible?" The current Corridor plan starts with existing pillar industries defined by urban areas and economic/hi-tech zones along the corridor – the assessment should be less constrained by the existing distribution of activities – a wider view is sought.

(ii) The focus of the Corridor is to identify a strategy (the "how" question) to realize the current plan, augmented by the further diagnostic work. Important issues addressed included: (i) how can economic activities be grown in the Corridor, (ii) how can new appropriate activities (including anchor firms and supply chain firms) be attracted (chasing Fortune 500 companies and China's largest 500 companies may not be the most effective strategy), and (iii) how can the existing economic structure be re-shaped to focus on its strengths – which in turn would provide a basis for rebuilding. This work encompassed key elements such as availability of conventional, micro, and venture capital. An important element of the strategy is advice regarding marketing of the region, increasing its profile – projecting a positive image.

(iii) Related to the foregoing are recommendations in regard to improving the enabling (including business) environment to grow economic clusters. This element of the strategy includes human resource development as well as conventional issues such as use of preferential mechanisms, government support, infrastructure, supporting business and producer services, etc.

Harbin

In Harbin, local officials requested two foci to the work (all of which are in the context of a Vision statement, as described above):

(i) Position itself as the "leader" of the Ha-Da-Qi Corridor in China and the world in a competitive way with other economic regions in China and internationally. While Harbin may have lost some of its cosmopolitanism it enjoyed in the past, being the lead city in the Corridor, it needs to represent the Corridor to other parts of China and the World. Accordingly, the CDS team worked with stakeholders, in the context of a pro-active Vision, to better position Harbin to play on the China and world stage.

(ii) Quality of residential neighborhoods. At present, new residential developments lack nearby services – both private and public. Many new communities are masses of apartments rather than true communities. This issue needed to be addressed within a larger urban amenity framework – although there are many problems such as air and water pollution and poor quality suburban and peri-urban development in the Harbin urban region, there are also many assets such as fine historic buildings, a dense and exciting core that will soon be served by a subway, etc.

Daqing

Local officials indicated that the CDS work should focus on two themes:

(i) Industry structure rationalization. Oil reserves continue to be depleted, putting this "one industry" city in jeopardy. CDS analysts worked with local officials to identify a new economic base. This involved closer interaction with Harbin to create a knowledge complex, encompassing the Harbin Institute of Technology and the Daqing Petroleum University along with other knowledge resources, assessing the feasibility of establishing petroleum services clusters for China in Daqing, etc.

(ii) How to market the city. Based on item (i) above, assist the city in developing a marketing strategy.

Qiqihar

Urban Environmental Management. The economic development of Qiquihar is challenging – it specializes in very large heavy equipment, armaments, turbines, etc. The priority CDS work involves improving environmental conditions, increasing amenity, etc., to make the city more attractive for investment in the core. This would involve cleaning up local lakes (e.g., Labor Lake), etc. Building on the work of the Italian team, an Urban Environmental Management strategy was produced. Directly related to this thrust are measures to improve the city's image for investments.

5. HA-DA-QI STRATEGY

By Douglas Webster[7] and Jianming Cai[8]

5.1 THE HA-DA-QI CORRIDOR: CHINA'S NEW FRONTIER

October 30, 2007

PURPOSE

This Strategy envisions a new future for the *Ha-Da-Qi Corridor*. In the Mid-Twentieth Century, the Ha-Da-Qi Corridor was one of the most important industrial areas of China, Harbin and Qiqihar were among the most important cities in China. Since then, particularly in the 1980s and 1990s, the Corridor has lost its former pre-eminent position, as the industrial core of China shifted to the Coast. The past cannot be revived, the Ha-Da-Qi Corridor should pursue a new future.

This strategy advocates a new dynamic Ha-Da-Qi Corridor; not by bringing back the past, but by the public and private sectors working together to create a re-emergent Corridor, based on the Region's *current comparative advantages* and *potential competitive advantages*.

This Strategy is not a blue print, rather it suggests direction and areas that will require further study and subsequent action.

CURRENT CONTEXT

The economy of the Ha-Da-Qi Corridor bottomed out by the mid-1990s, after large-scale layoffs in the 1980s and early 1990s. The Corridor has been quick to rebound in this regard, most laid-off people have found new jobs, often in small scale service enterprises, or they have reached retirement age. Some have been re-hired, for their skills, in new enterprises involved in agri-business, aviation, automotives, etc. With this stage of industrial transition nearing successful completion, it is now time for the Ha-Da-Qi Corridor to move pro-actively to create a new Twenty-First Century Economy. A Competitive Strategy for Phase II of the Corridor's economic fre-structuring is urgently needed.

The past economy of the Corridor focused on *Intermediate Goods* such as heavy machinery (industrial, energy-related, railroad rolling stock) and Primary Production, given its significant petroleum reserves in the Daqing area. But the petroleum reserves are running down and in the future, both in China, and Globally, *Consumer Goods*, such as automobiles, appliances, electronic items, pharmaceuticals, and high-value foodstuffs will increasingly drive economies. This represents bad luck for the Corridor given the past orientation of its economy, but also presents an opportunity to restructure.

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Neighboring Jilin Province came out of the 1990s better positioned to be the economic driver of the Upper Northeast with its #1 Automotive Cluster (a joint venture with Volkswagen which dominates the urban areas's economy) producing a consumer durable in high demand. Both Jilin and Liaoning Provinces, through rapid adjustment, involving loss of population in the 2000-2005 period, were able to improve their competitive positions. For example, during the 2000-2005 period, Jilin's economy grew about 1.5% faster annually than Heilongjiang's, the latter growing at about the Chinese norm. The current situation in the Ha-Da-Qi Corridor needs to be faced realistically, Harbin, the Corridor's largest city, has considerably lower GDP per capita and FDI inflows than its main competitors, Changchun and Shenyang. In fact, in 2005, Harbin attracted only $366 million USD in FDI, reflecting its low profile, poor business and investment climate image, and unclear future development strategy. Thus the situation facing Heilongjiang and the Ha-Da-Qi Corridor is very challenging but full of promise, if the right policies are put forward.

THE CHALLENGES

What are the challenges facing the Ha-Da-Qi Corridor?

The Ha-Da-Qi Corridor faces seven main challenges:

(i) *Lack of Entrepreneurship*

As one of the leading centers of large-scale state enterprises in China during the second half of the twentieth century, with an economy based on heavy manufacturing, petro-chemicals, pharmaceuticals, and technical educational complexes (particularly the Harbin Institute of Technology), it is not surprising that most of the Corridor's population are not entrepreneurs – large state enterprises have provided their families with security. For many in the region, fear of, or distaste for, entrepreneurship is deeply entrenched. However, China has changed, as has the world, with the private sector being the prime driver of new jobs and growth in household income in China. Thus the Corridor will need to become more entrepreneurial if it is to regain its former leadership role in China. The lack of entrepreneurship in the Corridor would be less serious if the Corridor were experiencing high levels of in-migration from other parts of China, a ready source of entrepreneurship, but it is not, and probably will not, for reasons of climate and remoteness. In many areas of China, including many interior areas of China, migrants from places such as Zhejiang provide "spark", but this is much less the case in the Corridor. *Thus, the Ha-Da-Qi Corridor must develop its own entrepreneurship culture.*

(ii) *Failure to Retain and Attract Talent*

The Corridor's development suffers from both a loss of talent through out-migration of young graduates and technically skilled people; and from a failure to attract new talent to the Corridor. Given the Corridor's geographical situation, it will be easier to retain existing talent than to attract new talent in, although both should be pursued. Thus a *talent retention strategy* needs to be a priority. Such talent retention strategies have been successfully deployed by regions in Western Europe and North America facing similar developmental dynamics to the Ha-Da-Qi Corridor. For example, approximately 90% of the students at the Harbin Institute of Technology leave the Corridor when they graduate, if this figure could be lowered by only 20 percentage

points through targeting of, and incentives to, the best students by the Provincial and Municipal Government, it would make a big difference in terms of the Corridor's future performance. A similar situation exists in regard to Daqing's leading technical institutes, particularly in petroleum engineering and related fields.

Attracting talent to the Corridor will be dependent on two factors: (a) increasing the livability (amenity) of cities in the Corridor and (b) creation of exciting enterprises doing leading edge work that will allow young people to advance very quickly, that is, fast track. Now, there are good jobs available in the Corridor, but often new very talented, usually young, employees cannot advance as quickly as in faster-paced regions such as the Lower Yangtze or Pearl River deltas. In other words, potential highly talented in-migrants are more sensitive to advancement opportunities in the Corridor than to entry level conditions per se.

(iii) *The Corridor's Dualistic Economy*

The Ha-Da-Qi Corridor possesses the most dualistic economy in China. That is, the State Enterprise sector essentially operates as an enclave, separate from the Private Sector. The Corridor's economy is not structured around clusters but around largely separate state enterprise and private cluster sub-systems. For example, the state controlled automotive cluster in Harbin in the past has not purchased parts from a world-class linear electric motor firm located nearby, yet the firm exports such parts, e.g., electric motors for auto seats, worldwide. Examples of such disconnects abound in the Corridor. The petroleum cluster in Daqing, whose operations are significantly controlled through a central bureaucracy in Beijing, has not created the energy servicing spin-off firms seen in other long-standing petroleum centers, e.g., Calgary, Canada, Houston, Texas, Aberdeen, Scotland. The challenge is for both the state and private enterprises to work together *cluster by cluster* to create viable competitive economic clusters by deepening linkages among firms.

(iv) *Harsh Climate*

The Corridor's harsh continental climate is a considerable disadvantage, increasingly so worldwide; people are moving to better climates and higher amenity environments as they become richer. This trend is clear in the United States (the movement to the Southwest), the European Union (purchase of second homes in the Mediterranean countries) and China (amenity migration to Hainan, Kunming, Qingdao, Zhejiang, etc.); it is a trend that will grow stronger. Local leadership, particularly in Harbin, has recognized this challenge and has attempted to capitalize on winter through the Harbin Winter Ice Festival, etc. However, much more can be done, e.g., creating a world-class ski resort near the Corridor, responding to the fact that skiing is China's fastest growing sport. Furthermore, the relatively cool summers need to be more aggressively promoted as an advantage.

(v) *Low Urban Amenity*

Although Daqing has done much to beautify the city and Harbin is becoming increasingly livable, there is a need to create high vitality urban areas in the Corridor. This obligation falls most directly on Harbin, not only does it need to act as the *flagship* of the Corridor, but within

Harbin high vitality neighborhoods need to be created to attract in-migrants, investors, etc., and to increase the quality of life for existing residents of the Corridor. Since Harbin is readily accessibly from virtually anywhere on the entire Corridor in a few hours, by train or car, Harbin's attractions should be promoted, and utilized, as public spaces for the entire Corridor. Harbin has much to work with, ranging from the best Sino-Russian architecture in the world, its cosmopolitan past, to its increasingly attractive riverfront. What is needed are high vitality lifestyle and cultural areas, and high-end neighborhoods that will appeal to investors, creative talent, etc.

(vi) *Remoteness*

As China's economic center of gravity has shifted over the last sixty years, particularly since 1980, the Corridor has become more remote. As High Speed Rail systems first connect key cities such as Shanghai and Beijing, and Beijing and the Pearl River Delta, the Corridor will become even more remote in terms of relative travel times. This is an obvious disadvantage, at least until High Speed Rail reaches the Corridor from Shenyang. However, from an international geo-strategic perspective, Harbin's location is much more promising, it is the closest Chinese city, in fact East Asian metropolis, to North America, the potential gateway to East Asia from North America. Its position is equivalent to that of Anchorage, Alaska or Vancouver, Canada, both of whom have effectively leveraged their gateway to North America functions.

(vi) *Revival versus Re-emergence Focus*

Last, but not least, there is still too much emphasis on reviving the old economic structure of the Corridor, rather than creating conditions for it to re-emerge with a new economy, more appropriate to emerging market conditions. Petroleum reserves in Daqing will essentially be depleted by mid-century, much of the heavy machinery manufactured in the Corridor is not competitive with Coastal or international brands, e.g., Siemens, General Electric. Yet, at the same time enormous opportunities exist in agri-business, given that the Corridor anchors China's most productive agricultural region; organic and green foods; high-end energy services; aviation gateway functions; and possibly time-sensitive high value manufacturing.

POSITIONING THE HA-DA-QI CORRIDOR

Given the need to create a new Ha-Da-Qi Corridor, a ***BIG BANG INITIATIVE*** is needed, not just incrementalism. This will require outside assistance, as systems usually only change when they have to, usually through external stimulus. This means that the Corridor needs national level assistance, accessible partly through the Heilongjiang Revitalization Office. National assistance needs to include re-structuring of policy frameworks facing the Corridor, and major project assistance, in support of a re-emergence strategy. This will require Corridor leadership to develop strong rationales for clearly defined national facilitation of development. Secondly, foreign investment is needed to bring in not just capital, but more importantly, new technology, and new ideas to the Corridor. Thirdly, although Phase 1 industrial re-structuring has been achieved successfully in the Corridor, there is a need for key clusters, dominated by state enterprises to more aggressively enter into joint ventures with leading global firms, particularly in the Pharmaceuticals and Automotive clusters.

COMPARATIVE ADVANTAGE

Comparative advantage is based on a Region's existing natural and human endowment, and is different from *Competitive Advantage*, which is about doing the same activity, e.g., pharmaceutical manufacturing, more effectively, i.e., competitively, than another firm, or in this case, region.

The Ha-Da-Qi Corridor possesses four obvious comparative advantages:

1. *Aviation*

The Corridor is approximately equidistant from Europe, North America, and South-East Asia, making it the ideal location for a Global Transpark, that is, a specialized logistics and manufacturing oriented aviation complex with facilities directly adjacent to taxiways. The manufacturing component would significantly include aviation products, Harbin is already a successful manufacturer of Embraer Regional jets and helicopters, based on successful joint venture agreements.

2. *Agri-Business*

The only category of multi-national companies seriously interested in the Corridor at present are the multi-national food companies, several of the leading firms have already located in the Region, e.g., Nestle, McCain's. This is a *clear signal* in regard to the Corridor's comparative advantage. In addition, leading national level agri-businesses have also located in the Region, particularly in the dairy industry, e.g., Eli, and Meng Nui. The existence of leading global and national agri-businesses in the Corridor is not an accident, Heilongjiang Province is China's leading food producer, with excellent soils, and an abundance of land.

3. *Tourism / MICE*[9]

The Corridor, and its surrounding area (with 2-3 hours driving time) possess significant comparative advantage to support Tourism and MICE activities, albeit the potential is seriously under realized. No comprehensive ski resorts exist despite the sport being China's fastest growing, and the existence of appropriate terrain. Large numbers of tourists, conventions, and meetings come to the Corridor, particularly to Harbin, in the summer to escape the heat of China's "furnace" cities, yet current activity summer tourism and year-round MICE activity is a fraction of the potential that could be realized from appropriate marketing and the existence of high quality facilities. A major growth trend in Tourism, one of China's fastest growing industries, is retreat or *slow* tourism, designed for Chinese or international travelers who want to be reflective, to escape from their fast-paced lives for a few days or weeks in a remote, perhaps forest or wetland environment. In particular, the potential of the lakes within easy driving distance of the Corridor are not being tapped as the significant tourism and amenity resources that they are, although lakefront land access issues do exist. Given the Corridor's location and

[9] Meetings, Incentive Travel, Conventions, Exhibitions

climate it is ideally suited for lake-based tourism, emphasizing retreat and slow themes, perhaps complementing Yunnan in China's south-west, which is currently pursuing this type of tourism strategy.

4. *Higher Education, Particularly the Harbin Institute of Technology*

The Corridor possesses some of the best technically oriented higher educational institutions in China, particularly the Harbin Institute of Technology (HIT) and the Daqing Petroleum University. Both could play a leading role in revitalizing the Region.

At present, HIT services the entire nation (as it should), but is not generating the number of local spin-offs or consultancies to local industry expected of an institution of its caliber, e.g., Stanford University in the US was and is the lead driver of Silicon Valley, the leading technological Region in the world. The Daqing Petroleum University, and associated research facilities, could do more to generate a high technology energy servicing cluster (as opposed to production servicing cluster), which would make Daqing a more vital and sustainable city, important because petroleum reserves are declining. Although progress is being made, e.g., HIT recently established a Science Park, much more needs to be done, e.g., in terms of availability of abundant incubator space, (as in southern Wuhan), and venture capital.

Daqing' Petroleum knowledge cluster, anchored by the Daqing Petroleum University, which includes key research institutions such as the Petro Chemical Institute of Heilongjiang Province) should be supported and marketed as the pre-eminent petroleum knowledge center in China, competing with world-class higher education petroleum-oriented institutions such as the Colorado School of Mines in the USA, and the University of Calgary in Canada.

The preceding four areas of comparative advantage are obvious foci for a re-emergence strategy, and should be seriously studied – *as a key component of the rationale for identification of strategic thrusts based on economic clusters*.

KEY STRATEGIC THRUSTS

REALIZE THE CORRIDOR'S HUMAN RESOURCE POTENTIAL

BECOME CHINA'S AVIATION GATEWAY: A GLOBAL TRANSPARK

BE CHINA'S AGRI-BUSINESS & GREEN AGRICULTURAL CENTER

EMERGE AS CHINA'S MODERN MEDICINE HUB

BECOME CHINA'S BACKYARD: A LAND OF LAKES, CONTEMPLATION, AND WINTER SPORTS

FACILITATE LOCATION OF BUSINESS & PROFESSIONAL SERVICES, PARTICULARLY BACK OFFICE FUNCTIONS

ESTABLISH HARBIN AS THE FLAGSHIP OF THE CORRIDOR – REVIVING ITS COSMOPOLITANISM

REALIZE THE CORRIDOR'S HUMAN RESOURCE POTENTIAL

Unless the Corridors' people can become more entrepreneurial in attitude and behavior, none of the following strategic thrusts can be realized, not matter how much investment or technological know-how is invested in the Corridor. The prime difference between Zhejiang Province and the Corridor is not that one is coastal in location, and one is remote, but that one is entrepreneurial and one is essentially not. The lack of entrepreneurship in the Corridor is not surprising; the region was the former bastion of state enterprise heavy and petroleum-based industry. The lack of local entrepreneurship is *signaled* by the fact that outside migrants take advantage of entrepreneurship vacuums created by the local population. This is seen at all levels, for example, at lower levels, people from Anhui Province make considerable profit recycling waste, while people from Jiangsu Province play an important role in the construction sector.

What to do?

1. A set of initiatives should focus on the young. At the high school level, the concept of entrepreneurship should be introduced and explained, using examples from China's long history of entrepreneurship, both at home and in places such as South East Asia and North America. Global models exist. For example, Arizona State University, with the largest student population in the United States, requires every student to enroll in a one- credit course in entrepreneurship.

2. This initiative should be reinforced with real action at the University level. All technical degree programs, e.g., in engineering and computer science, should be co-op in nature. That is, all students would need to work approximately one-third of the year in a dynamic firm in their subject matter while pursuing their degree. This would require adding approximately one year to the time required for a Bachelors level degree but the rewards to both the individual and society as a whole are very large. Global models exist, one of the best is the University of Waterloo, Canada's leading science, technology, mathematics, and computer science university.

3. As noted, faculty in higher learning institutions need incentives to participate in local start-ups, consult locally; and the institutions as a whole should be active in encouraging the formation of real research parks (not "standard" high technology zones), either directly or indirectly.

4. Leading senior students at HIT, and other leading higher education institutes should be targeted and actively courted by the local government and business community to stay in the Corridor after graduation. One of the best means to retain talented graduates is to offer them "fast track" opportunities in business or government – they are impatient people. Again, many examples of best global practice in this area exist.

5. In addition to availability of venture capital, a specialized form of capital, designed to finance ventures with a high risk of failure but also potentially very high payoffs, more conventional credit needs to be made available to Small and Medium Enterprises (SMEs). World Bank studies

show that Corridor SME's have close to the poorest access to credit in China. This may be because they have performed poorly in the past (as businesses or in repayment) and thus it may be a "chicken and egg" problem, however, entrepreneurship requires capital.

6. Complementing the need to make more capital available is the need for specialized small business courses at night in basic skills such as accounting, small business management, dealing with government bureaucracies, etc.

7. Last but not least, local entrepreneurs need to be acknowledged in the Community. Annual entrepreneurship awards should be presented by the Governor at public events and banquets, with high levels of media coverage.

BECOME CHINA'S AVIATION GATEWAY: A GLOBAL TRANSPARK

A system of Global Transparks is being created worldwide – in North Carolina, USA, in eastern Germany, in Belgium, at Subic Bay in the Philippines, etc. The distinguishing characteristic of these complexes is that they are located on major air routes and that planes (including giant Antanovo, Boeing 747, and Airbus 380 cargo planes) can taxi right to the loading bays of facilities (factories, logistics centers) located along taxiways.

1. The Corridor needs to position itself as China's aviation gateway both to: (i) overcome a very serious negative factor – it is landlocked, a key cause of underdevelopment world wide, and (ii) to take advantage of a key positive factor, it is on the great circle route (the route which minimizes flying time) from many North American and European cities to Beijing, South East Asia, etc. Furthermore, the Corridor's major airport, at Harbin, is ideal for such a facility, with available vacant adjacent land, etc.

2. As the future aviation gateway to China, particularly from North America, the Corridor's Global Transpark could play a similar role to Anchorage, Alaska. There, FedEx, one of the world's leading global courier companies unloads inbound shipments from East Asia and resorts and reloads them for delivery to addresses across North America. The Ha-Da-Qi Corridor could play an identical role for inbound shipments to China, a role currently played by Manila and Guangzhou, but one for which Harbin is better located. The significance of this role cannot be underestimate. Anchorage is a small city (population: 263,000) yet is the *third most important air cargo hub in the world*, handling 2.7 million metric tonnes of air cargo in 2006 (a 5.4% year-on-year increase); only Memphis (which plays an identical role for eastern North America) and Hong Kong handle more air cargo. (In 2000, Anchorage was ranked seventh in air cargo, indicating the rapid emergence of its gateway to North America function.)

Analysis of World Bank trade data indicates that between 1980 and 2000, GDP grew by 72%, trade by 132% and air cargo by 302% for 68 countries for which 20 years of data are available. Even within the highly cyclical aviation sector, when downturns occur, air cargo recovers faster than passenger flows.

3. Although the Corridor's high technology economy is very small, there is no reason it could not expand if higher education institutions and entrepreneurs take action. Already, silicon chip

manufacturing is underway in Daqing and world-class micro linear electric motors (Harbin Tech.Full Industry) in Harbin. These are the types of products (high value to weight and bulk) that can justify air cargo costs. *Thus the Corridor should specialize in such high value: weight products, suited to air shipment, not massive machinery, as was the case in the past.* (The past economic geography of the Corridor, when viewed from a market perspective, was essentially an artificial one.) High value agricultural products, e.g., exotic mushrooms, can also easily absorb the costs of air cargo, and thus establishment of a Global Transpark would also create significant synergies in regard to agri-business.

4. Aircraft manufacturing is already well-established in Harbin under the umbrella of the Harbin Aviation Group, with brand recognition in the form of Embraer regional jets. Such manufacturing facilities could move to the proposed Global Transpark; and over time, the aviation cluster could be deepened through manufacture of a wider array of parts, etc. The latter would fit the high value: weight criterion noted above.

5. China, like much of Asia, is significantly short of commercial and general aviation pilots. Pilot training is a very fast growing industry in China. Pilot training schools are well-suited for locations such as Harbin, if proper facilities exist, given the relatively uncrowded skies, low living costs (pilot trainees require affordable subsistence), etc. For example, Canada' largest pilot training school, which trains pilots for North American and Asian airlines is located in Vancouver, an analogous location to the Corridor.

6. Realization of the Corridor's role as the aviation gateway to China will require national level action. Firstly, the national government would need to designate the Global Transpark area as a duty-free ("in bond") / export processing zone. Secondly, the national government would need to declare an open skies policy for Harbin based cargo aviation only. The justification for this special status to the Corridor is that its revitalization (a national policy), is dependent on a *big bang* initiative, it cannot be accomplished incrementally.

7. The Global Transpark should be a Corridor initiative, not a Harbin focused one. In particular, the entrepreneurial energies currently evident in Daqing's High Technology Development Zonev would need to be captured to make the initiative a success.

BE CHINA'S AGRI-BUSINESS & GREEN AGRICULTURAL CENTER

Agri-business is the only cluster in which the Corridor enjoys both comparative and competitive advantage, i.e., in several agri-business activities it is the most effective producer. Furthermore, it is the one activity that *unites* the Corridor, all Municipalities along the Corridor have significant agri-business activity or potential.

The proof of the Corridor's comparative and competitive advantage is signaled by the impressive list of multi-national agri-business corporations operating in the Corridor, including CP from Thailand (poultry), Nestle from Switzerland (Milk products), McCain's from Canada (potato-based foods and snack foods), Anheusher-Busch from the USA (malt for beer), and Celestial NutriFoods from Singapore (soy products). In dairy products, the Corridor represents an immediate geographic extension of the Inner Mongolian dairy belt (the hub of China's dairy

industry), with leading national firms such as Eli and Meng Nui located in the Corridor. The economic importance of agri-business is indicated by the fact that 28% of GDP in Harbin and 26% in Qiqihar is accounted for by agricultural activity. Heilongjiang is the leading agricultural producer, by value, in China.

Not only is the Corridor very well-positioned to produce primary and more importantly, prepared food items, but the global economic context is excellent, *food is the new hot global commodity*. For example, the Food and Agricultural Organization of the United Nations expects agricultural commodities to be 20-50% higher in price over the next decade, relative to their average over the last 10 years. The IMF indicates that global food price inflation is currently twice as high as for non-food commodities. Wheat and dairy prices, and a number of other food commodities, are at all time highs.

However, there are problems in terms of agri-business in the Corridor, including: (i) There is often a lack of value added in Corridor-based production, that is, primary agricultural commodities are not processed to the extent that they could be, based on rapidly changing consumer market conditions in China and East Asia, (ii) Accessing land for primary production can be cumbersome – it is difficult, and often expensive, to assemble large land areas for particular agricultural commodities, e.g., potatoes.

If the Corridor is to realize its agri-business potential, making agri-business one of the key driver's of the Corridor's economy, it should take the following actions:

1. The Provincial Government, through an appropriate office, e.g., the Heilongjiang Revitalization Office, should commission a world-class agri-business strategy for the Corridor led by a leading international agri-business consulting firm.

2. The Corridor should host a ***GLOBAL FOOD EXPOSITION***, with leading edge presentations, workshops, and exhibitions, focusing on the consumer, including new technologies, new types of foods, e.g., fusion, fast, organic, and green foods. As families, and particularly women, become busier outside the home, around the world, the demand for snack foods, prepared meals, diet foods, healthy foods, etc. will increase exponentially. The Corridor should ride this economic wave. Leading agri-business firms, outstanding globally recognized "downstream" agri-business professors, etc., should play a key role in the staging of this exposition.

3. The Corridor's agri-business firms need to create a new set of food products, geared to the mass middle class market in China, Asia and elsewhere. This will require co-operative action by local, national and international universities specializing in agriculture, and agri-business firms operating in the Corridor. In particular, based on Futures Analysis, new types of consumer driven foods should be identified, e.g., cereals (becoming more popular at breakfast in East Asia), dairy products (growing very rapidly), fast foods and snack foods, exotic foods, e.g., certain species of mushrooms, organic foods, and green foods. Given the Corridor's global geographic position, and expected improvements in access (as outlined above) prepared foods can be exported in large amounts worldwide. Thailand's CP Corporation is an excellent model in this regard, exporting Chinese and Mexican snack foods to North America, dim sum products to Southeast

Asia, etc., all from its Thailand base. Since the CP Corporation already operates in the Corridor, it could be a significant resource in this regard.

4. Related to the foregoing, the Corridor will need to establish brand names for prepared food items. Since small firms cannot do this on their own, there is a need for a strong prepared foods business organization in the Corridor, controlled and managed by agri-business firms operating in the Corridor, to create brands based on assured quality, taste, safety, etc. This will pay a particularly high economic premium, given recent issues involving the safety of the Chinese food supply system.

5. The agricultural land issue needs to be dealt with. There are many successful models to address this problem enabling individual farmers to retain their land and benefit from high value production, while creating large-scale production units (fields). For example, in Malaysia, local farmers band together to produce one crop either as a co-operative, or by allowing one firm to do it, in exchange for an equity position in the output. Addressing the land problem will require tripartite co-operation among farmers (represented by a Corridor Farmers' Association, the producers (represented by an agri-business firms organization – noted above) and relevant government authorities, such as Bureaus of Land and Natural Resources.

6. Another serious constraint to the development of agri-business in the Corridor is the lack of a world-class large-scale packaging industry. Proper packaging dramatically increases the financial returns to agri-business by putting a fresher product on the market, and through presentation to increasingly affluent, fussy, and concerned consumers.

7. Related to the foregoing is the need for higher quality supply chain management, particularly refrigerated chains ("cold chains") from the Corridor to the Chinese market. (This is a China wide challenge but if Corridor firms were known for high quality cold chains, local firms would have a very significant advantage in sophisticated markets such as Beijing and Shanghai.) The technology is not a problem, for example, CP distribution vehicles in Thailand are thermostat equipped with technologies that transmit temperatures in the trucks back to the logistics centers in real time so that CP logistics management knows the temperature in all its trucks at all times, enabling it to take immediate action or remove potentially tainted food from the market. Once reliable cold chain technologies are in place, this should be an important component of the branding of Corridor agricultural products.

8.Another key initiative that needs to taken is to create a world-class prepared foods University Faculty in the Corridor. Such departments already exist in some higher educations in the Corridor but need to be up-graded to be more consumer oriented, and world-class in terms of technology and approach.

9. Last, but far from least, the Corridor needs to facilitate the rapid growth of organic and green produce. Consumption of organic food increased by 50% in China in 2006. Most organic food produced in China is sold overseas to Japan, Taiwan and other Asian countries. Official figures show organic food exports from China totaled $350 million USD in 2005, up from $150 million in 2004. China has about 5.7 million acres of certified organic farmland, behind only Australia and Argentina worldwide. Given these trends, the potential for the Corridor's green and organic

agri-business industries is enormous.

10. In marketing its prepared agricultural products, the Corridor should stress its *frontier* location – frontiers are associated with less pollution – this is particularly true in the case of green and organic foods.

11. From a developmental perspective, a major benefit of agri-business is that it links the city and the countryside through strong economic linkages. Large numbers of farmers are and factory workers are employed in agri-business clusters. This linking of the urban and rural economies is consistent with the *Socialist New Countryside* policies, being stressed by the current Chinese Government, including in the *Eleventh National Development Plan*. Accordingly, national government support to an agri-business driven Corridor Development strategy is likely to be strong.

EMERGE AS CHINA'S MODERN MEDICINE HUB

Harbin has along history as an important pharmaceutical center in China, related to its role in the Korean War as a prime producer of anti-biotics. The cluster, dominated by the Harbin Pharmaceutical Group, is large, known for mass production, reflected in a large number of factories and associated administrative and research facilities spread across several economic zones throughout the Harbin metropolitan area. However, the weakness of the cluster is that it relies on large-scale production of inexpensive traditional products, e.g., antibiotics. The cluster's expenditures on Research and Development are about 3% of revenues, close to the norm for Chinese state enterprises, but not high enough to constitute a truly innovative industry. Given the long and successful history of the pharmaceutical industry in Harbin, it is a major asset that needs to be re-positioned to help drive the re-emergence of the Corridor. The fact that the Chinese market for medicine is growing quickly and moving up-market supports re-positioning of the cluster. Priority initiatives that need to be considered include:

1. The Harbin Pharmaceutical Group should establish a joint venture with a major global pharmaceutical group such as Pfitzer. Advantages to the Harbin Pharmaceutical Group would inclue access to technology and manufacturing/distribution rights, possible increased access to international markets, etc. The advantages to the foreign firm would include access to the Chinese market, and a more cost-effective environment to undertake research and development activities.

2. Re-positioning of the medical industry in the Corridor should take advantage of the movement in medical products to more organic based drugs, and less reliance on chemicals, an obvious advantage of Corridor based pharmaceutical firms, given the Corridor's strong agri-business firms.

3. If the pharmaceutical cluster is to deepen its Research and Development activities, it requires strong ties with relevant units in the Harbin Institute of Technology, the Medical University of Harbin, etc.

4. A strategic study should be commissioned on the pharmaceutical cluster in the Corridor, led by a leading international research firm, specialized in the pharmaceutical industry.

BECOME CHINA'S BACKYARD: A LAND OF LAKES, CONTEMPLATION, AND WINTER SPORTS

Tourism and MICE are one of China's fastest growing industries. The Corridor can potentially be a major player in China, benefiting from the growth of this industry, both in terms of national and international visitors.

One advantage of the Corridor is that it can attract both summer and winter vacationers. In winter, nearby winter sports, particularly skiing is the dominant attraction; while in summer, the relatively cool temperatures are the major attraction – both to conventions and private travelers. However, the potential of the Corridor for Tourism and MICE is being significantly under realized. This contrasts with Yunnan at the opposite end of China (the South-west), which is increasingly capitalizing on it frontier location, turning remoteness into an asset. Key initiatives that should be considered for immediate action are as follows:

1. A Tourism / MICE master plan and strategy for Heilongjiang Province, that would indicate the role of the Corridor in developing this key industry, needs to be undertaken, led by a world-class tourism planning and marketing firm.

2. Heilongjiang Province contains some of China's finest lakes, yet the Province lacks a notable lakefront hotel or resort. Although most of the best lakes for tourism development are outside the Corridor, the Corridor would capture much of the value associated with their development (e.g., travel to/from the lake resorts, purchase of food and other goods, labor, construction). Europe and North America are famous for their lake resorts that capture large summer, and smaller winter populations. Famous areas include the Adirondacks in New York State, and Lake Tahoe in California, USA; the Muskoka area north of Toronto, the Laurentian area north of Montreal in Canada; Lake Como in Italy, etc. Yunnan Province has a major lake-based tourism initiative underway. Lake front resort development requires careful planning, to ensure the beauty of vistas and to ensure that the carrying capacity of the lakes is not exceeded. Based on the North American and Western experience, the first step in creating an image for a lake, effectively branding it, is to construct a well-designed, high quality hotel on the Lake Front such as the Lake Louise Hotel west of Calgary, Canada. Follow up publicity in trend setting tourism magazines such as *Travel and Leisure* and *Conde Nast* is then needed.

A constraint in terms of this type of development in Heilongjiang is that much of the best lake frontage is leased to key state enterprises or agencies, an historical legacy. However, this constraint should be correctable through land swaps, etc.

3. Heilongjiang needs to develop world-class downhill (and secondarily cross-country or Nordic) ski facilities. Although downhill facilities exist in the Province, there is a lack of recognition of the fact that skiing is a culture, not just going down hills. Accordingly, experienced international developers need to be attracted to develop a quality ski hill with a good hotel, modern ski technology, after ski (après ski) facilities, condominiums, etc. Once the standard is set, it is likely

that imitators will follow. Numerous examples of global practice in this regard exist, e.g., Whistler in British Columbia, Canada, many resorts in the European Alps, to Winter Park, Utah, USA.

The success of the Harbin Winter Ice Festival, one of the world's top three winter festivals, along with those in Quebec City, Canada, and Sapporo, Japan, means that Harbin, and by association, the Corridor, already has a global profile in regard to winter sports. That positive association needs to be extended to include skiing.

4. To raise its image as a leading global winter playground, the Corridor should seriously consider competing to host the Winter Olympic games. Even if the Corridor does not win, it will have dramatically increased its profile, and the Corridor will have increased the probability of hosting the games in the future.

5. Harbin lacks excellent five-star hotels and hotels with on-site convention facilities. If adequate facilities existed, summer and winter MICE activities would likely grow rapidly, e.g., as firms and government agencies undertake training and retreats chose Harbin as their venue, especially during the hot summer in most parts of China. As noted, countryside venues could be popular for MICE activities, e.g., on lakes.

6. One particular problem that needs addressing is the low quality of hospitality services metropolitan-wide in Harbin, and even more seriously in the secondary cities of the Corridor, Daqing and Qiqihar. Even in the best hotels, service is poor, and the cities, including Harbin, lack an array of interesting restaurants.

In Daqing and Qiqihar, basic services that international business travelers, and many domestic business people, require are just not available, e.g., quality hotel rooms, reliable internet service, daily delivery of English language newspapers, etc. Unless this problem is addressed, it is difficult to see widespread investment in the Corridor, especially outside Harbin.

One means to address this problem is to strengthen tourism management technical schools in the Corridor, ensuring that they have strong co-op programs that involve students directly in hospitality businesses in the Corridor.

7. In particular *slow* tourism is appropriate to the Corridor and its surroundings. Increasingly, in today's fast-paced world, tourists prefer to stay in one place enjoying the quiet of a lake or a wetland, e.g., the extensive wetland area straddling Daqing and Qiqihar Municipalities. Related to slow tourism is retreat tourism where firms or individuals go to a quiet area to reflect, often about the future.

8. In addition to the foregoing, Heilongjiang possesses several niche attractions, capable of attracting domestic and international visitor, e.g., one of the world's longest steam powered narrow gauge passenger railways in Xinglong Forest (millions of people in the world are serious railroad fans), the Siberian Tigers (both in their Harbin complex and in the wild), etc.

9. The Harbin Tourist Bureau has currently identified 31 projects for possible foreign investment. There is a need to prioritize these projects, and actively pursue funding for a sub-set of them. A similar process needs to occur in other Corridor Municipalities.

FACILITATE LOCATION OF BUSINESS & PROFESSIONAL SERVICES, INCLUDING BACK OFFICE FUNCTIONS

Like many, if not most, second-tier Chinese urban systems, the Corridor, and Harbin in particular, lacks business and professional services, e.g., accounting, legal, advertising, design, computing etc. Similarly it lacks international banks, with the exception of one Russian bank in Harbin. This situation is unlikely to change significantly in the near future, however, certain steps need to be taken, as outlined below:

1. Instead of artificially trying to establish a high-end business and professional services economy, the Corridor should identify the likely service spin-offs from the key economic cluster based strategic thrusts proposed. For example, if the agri-business strategic thrust is successful it will require advertising and printing services associated with packaging, research services on food preferences in China and around the world, etc. Similarly, if the Global Transpark aviation initiative were successful, it would require services such as pilot training, logistics services, logistics software, etc. In this regard, it is suggested that there be *cluster-by-cluster assessment* of the likely business and professional service requirements of each cluster to operate more competitively. This information can then be disseminated in support of attracting such services to the Corridor. This service needs assessment should involve the cluster firms themselves as the key participants, although government agencies can play a key convening or facilitating role.

2. Corridor leadership should attempt to attract more international banks to Harbin, to serve the Corridor. For example, could HSBC, ABN, or Citibank be attracted to the Corridor? International banks obviously locate in geographic regions on the basis of markets, but *within regions*, other factors come into play. In other words, an international bank at some point may decide to locate in Upper North-East China, but may be somewhat footloose in terms of locating in Changchun or Harbin.

In regard to the banking system as a whole, as has been noted, there is need to make more credit available to SMEs. Although there is a danger of creating moral hazard, consideration could be given to some level of guarantees for certain types of lending, e.g., innovative start-ups in the key cluster areas.

3. The Corridor has high comparative advantage for free-standing back office services – call centers (ITO) and Business Processing Operations (BPO), such as accounting, medical records. This is an emerging, but fast-growing industry in China, now well established in a number of Chinese cities, Dalian for example – which specializes in Japanese language call centers. The Corridor's cities are ideal for back office services because they contain relatively highly educated populations (much higher than the Chinese urban norm), but at the same time, labor is inexpensive and available. Since back office services, by definition, do not require physical contact with customers or corporate headquarters, it is an industry that is not constrained by remote location. Initially, the emphasis should be on back office operations serving the domestic

market – for both Chinese and international firms operating in China. However, over time, as second language skills proliferate in the Corridor, the industry could move into international back office operations – both call centers and BPO operations.

The growth potential of back office operations in remote cities in China with well-educated populations, such as the Corridor is substantial. Although China contains over 20% of the world's population, it currently generates only $2 billion USD of the $74 billion generated by back office services world-wide.

4. A second exception to the foregoing is positioning the Corridor, and Harbin in particular, as a North-East Asia business hub. Already, the Corridor attracts sizeable numbers of Japanese, Russian, and South Korean tourists and business travelers.

As North-East Asia becomes more economically integrated, a future that the Asian Development Bank has been pushing, and if North and South Korea become more integrated, venues for North-East Asian business and inter-governmental meetings will be avidly sought. The Corridor is close to Vladivostok, Seoul, Pyongyang, Tokyo, and other key North-East Asian business centers. This is a role that Bangkok has effectively captured for the Southeast Asian and Mekong markets.

The prerequisite actions for the Corridor to become a North-East Asian meeting center include all those related to the MICE function outlined above, as well as many of those related to Harbin becoming the flagship center of the Corridor (again, above), and the need for improved aviation services (related to the Global Transpark function outlined above). In addition, aside from a confluence of external geopolitical events outside the influence of the Corridor's leadership, an important prerequisite is marketing, and becoming an early mover by attracting a few high-profile meetings, e.g., Asian Development Bank meetings on North East Asia cross-border development schemes.

ESTABLISH HARBIN AS THE FLAGSHIP OF THE CORRIDOR – REVIVING ITS COSMOPOLITANISM

Harbin was once one China's most cosmopolitan cities, in the early twentieth century on a par with Shanghai in terms of cosmopolitanism. Although much of the architecture from that era remains, the city itself, as a socio-economic and cultural entity has become more parochial. Yet current research clearly indicates that cosmopolitanism, an openness to global forces, is a key ingredient in terms of economic success in Asia, witness Shanghai, Singapore, or Bangkok.

To treat every area of the Corridor equally will not work, to a significant extent, reviving the Corridor will require making Harbin the Corridor's international flagship. This will involve improving Harbin both in terms of its physical environment, and reviving its cosmopolitan past. In other words, Harbin should become the *Flagship of the Corridor*.

Key actions to be considered to position Harbin as the flagship of the Corridor include the following:

1. Create a World Class entertainment / lifestyle area in the *Garden Area* near Guogeli Street, which would contain high end apartments, fine restaurants, cafes, bars, cultural venues such as workshops and theaters for performing arts, etc. In other words, create an uptown area that would resemble Xintandi in Shanghai. Such an area is needed to create a neighborhood for high-end talent to live in and/or visit. All globally successful cities have such a lifestyle area.

2. Continue to preserve and rehabilitate Harbin's extensive inventory of historical buildings. Harbin has done a very good job in this regard; the next step is to revive the interiors of buildings, based on a living culture model.

3. Take actions to become China's first eco city. In the past, Harbin has had a poor reputation for polluted river water, air pollution, etc. The best way to erase this image is through a dramatic change in the city's environmental quality, for example, exceeding China's current guidelines to reduce noxious emissions by 4% per year. The technology for a dramatic change in Harbin's environmental performance is readily available; and the closing down or spatial dispersal of most heavy industry has increased its feasibility. The relative low level of motorization and Harbin's high densities (the built up area has among the highest densities in China: 15,546 persons per kilometer, higher than any other city in China except Wuhan) means that if rail rapid transit systems are built quickly, Harbin can escape some of the most adverse impacts of motorization, particularly if private vehicles do not become a major mode for travel to work on a daily basis. In addition, the large reserves of natural gas in and adjacent to the Corridor mean that this much cleaner burning fuel (than coal), can be used to generate electricity, and for other urban energy requirements.

4. A New Central Business District (CBD) is emerging in Harbin, in and around the existing Shangri-La Hotel. Important recent developments include the riverfront high-rise residential and office towers being constructed, the banking cluster arising across from the Shangri-La, the planned expansion of the Shangri-La hotel, the existence of a major shopping mall, the redevelopment of the former railway rolling stock complex by a Shanghai developer, etc. This organic or self-organizing development of a new CBD should be reinforced and supported by the local government. For example, there is need for another five-star hotel in the area, more entertainment venues and street level activity at night, additional Class A office space, etc.

5. Overall, Harbin needs to move up a level in terms of the quality of its physical development. It needs a few high-end neighborhoods with "buzz", plus an overall improvement of amenity, e.g., street lighting and landscaping, across the metropolis. Entry of international quality developers into Harbin's development could be a major catalyst to set this dynamic off, as well as accelerated construction of the subway systems which would enable Harbin to retain its high densities, while avoiding congestion.

CORRIDOR DEVELOPMENT: SPATIAL DIFFERENTATION

As has been argued, successful development of the Ha-Da-Qi Corridor will depend on deepening of a few economic clusters in which the Corridor enjoys comparative advantage, and the potential to establish competitive advantage. Physical development is important in this regard, but in isolation will not drive Corridor development. Economic zones are abundant in China, in

fact in surplus. Although land is abundant in the Corridor, and thus development of economic zones does not require infringing on *protected agricultural land*, it is a relatively weak comparative advantage compared with those put forward above, based on economic clusters. However, at a more macro scale, certain supply-side infrastructure improvements are needed, in particular extension of the Corridor expressway from Daqing to Qiqihar. And, within the next ten years, introduction of High Speed Rail service along the length of the Corridor, which would turn the Corridor into one functional city.

FUNCTIONAL DIFFERENTIATION ON THE CORRIDOR

There is a danger in over-planning the Corridor; however, different Municipalities along the Corridor obviously exhibit different comparative and competitive advantages.

As a general principle, lower value manufacturing processes should be decentralized up the Corridor (towards Qiqihar) and to smaller urban centers given the lower cost of living in these centers. This model is found in much of coastal China, for example, Xiamen specializes in high value manufacturing, such as the actual flat HTDV television screens, whereas as one moves up the coast, manufacturing is oriented to lower quality inputs, e.g., plastic moldings for the televisions.

Qiqihar

Qiqihar should focus on being a high quality smaller city. It may continue to lose population, but this should not necessarily be regarded as a negative. Many small cities are economically powerful and offer high quality of life to their residents.

Qiqihar's strongest comparative advantage lies in the production of green food, in fact it promotes itself as the Green Food Capital of China. The economic zone near Fulaerji, which specializes in agri-products such as tomato ketchup, rabbit meat and products, etc., indicates considerable potential, given its alignment with the Municipality's comparative advantage.

Daqing

Daqing's comparative advantage lies in the fact that it is the only locale along the Corridor with a significant percentage of migrants. Hence, it is the most entrepreneurial node on the Corridor. Given its petroleum reserves, its fiscal resources are very significant, especially in per capita terms, compared with other centers on the Corridor. These fiscal resources should be leveraged in support of entrepreneurial activities, such as high tech start-ups and in support of human resource development, as well as improving the city's amenity. Daqing's current development strategy and fiscal allocations essentially already reflect this orientation.

As has been argued, if Daqing is to a sustainable city, and not collapse as petroleum reserves decline dramatically by mid-century, it needs to purse a Calgary development model, that is become a world class energy knowledge and services center.

CORRIDOR EXTENSIONS

Static boundaries for the Corridor may not appropriate. Consideration should be given to extending the Corridor to Mudanjiang, which would provide a direct link to Russia, would incorporate key tourist landscapes (discussed above), as well as shale reserves, which could prove important in terms of Daqing's economic future as conventional petroleum reserves fall.

To the northwest, economic interaction with Inner Mongolia should be strengthened, especially given the emphasized agri-business strategic thrust. Inner Mongolia has excellent soil resources, and is the hub of China's dairy industry.

MAKING THE CORRIDOR HAPPEN: GOVERNANCE & LEADERSHIP

CORRIDOR IMPLEMENTATION

The Provincial Government has established initial mechanisms to jump start Ha-Da-Qi Corridor development.

1. The next step is to establish a Corridor Development Authority, or equivalent, that will facilitate and co-ordinate rapid Corridor Development. This Authority will need to closely involve key private sector actors as well as relevant government authorities. An important role of government will be to facilitate cluster-based organizations, etc. The Corridor Authority's emphasis should be on facilitating the economic development of the Corridor, not just the physical development of the Corridor, the latter involving rather routine functions such as provision of industrial zones, etc.

2. Based on assessment by the World Bank and others, a major problem in the Corridor is that investors do not rate the business and investment climate highly; in fact, they rate it among the lowest in China. This means that local governments in the Corridor must make a concerted effort to improve investor support, honor investor agreements, etc. Leading economies in China, and elsewhere in East Asia, are often characterized by one-stop services for investors that enable them to initiate operations quickly, with a minimum of unnecessary cost and wasted time. If a business identifies the Corridor as a location that holds comparative advantage for their activities, and potential competitive advantage, they should not be discouraged from investing in the Corridor by the prevailing business climate.

3. The national government has designated Heilongjiang as an official area for revitalization. Corridor leadership, working with key Provincial agencies, should utilize this special status to effect a major turn around in the Corridor's economy. Rather than incrementally pursuing small project funding, which is unlikely to make a major difference, they should pursue changes in policy frameworks, or the "rules of the game" which would give the Corridor real comparative advantage, e.g., a Harbin open skies for cargo agreement.

4. Related to the foregoing, the Corridor is very well positioned to become a leading area to implement *New Socialist Countryside* concepts. Especially in the area of agri-business, linkages between urban and rural areas are very strong, a key tenet of the new countryside policy. In the

Corridor area, there is considerable opportunity to significantly lessen rural-urban disparities based on strong agri-business performance. Equally important, effective implementation of new countryside policies will strengthen the hand of Corridor and Provincial authorities in regard to national policy changes discussed above (#4).

5. When regions or cities experience economic problems they often become "tight" in their planning styles. It is equivalent to some sports teams that, when behind in the game, lose their flexibility, which would enable them to win. Local governments in the Corridor should not over plan economically or physically. For example, in Harbin, world-class neighborhoods and zones will only emerge if leading developers and designers have the flexibility to do their best work, within design, Floor Area Ratios, etc., determined by the local authorities.

PROMOTION, MARKETING & BRANDING

1. Corridor Authorities should commission a world class place place oriented marketing company to brand and market the Corridor. To some extent this will involve overcoming past negative images, e.g., the 2005 water pollution incident, problems with consumer goods quality, the poor business and investment climate, associated with the Corridor. But very positive images exist to be utilized, e.g., the Winter Ice Festival.

2. The Corridor needs to establish itself as a brand. A logo is needed – perhaps the Siberian Tiger, which implies strength, emergence of economic power in East Asia, e.g., South Korea, Singapore, etc. The Panda image has worked very well for Chengdu.

Similarly, the Region needs a motto, or what is known in North America as a "tagline". Perhaps the tagline could incorporate positive images associated with the Corridor's Frontier location, e.g., ***The Ha-Da-Qi Corridor: China's New Frontier***.

3. Trade Fairs and other events to publicize the Corridor should not overly emphasize physical attributes, such as economic zones. Such a supply side based infrastructure approach to development puts the Corridor in direct competition with other Chinese regions, many of which are highly competitive. Rather, key areas of *comparative advantage*, associated with *key strategic thrusts based on economic clusters* should be the basis of Corridor development and promotion. For example, the potential of the Corridor to be East Asia's agri-business hub, based on real comparative advantage, and an emerging track record with leading multi-national and domestic agri-business firms could be the basis of a Corridor trade fair or promotion effort, rather than promotion of industrial zones. Major investors are already overwhelmed by literature and information on industrial zones in East Asia. For example, South Korea's economic zones are heavily promoted in international publications worldwide, such as the *Economist*, it will be very difficult for the Corridor to compete on the basis of an infrastructure-led supply side development approach.

4. In marketing the Corridor internationally, connections to a very cosmopolitan past could be helpful. For example, Russians have a very positive image of the area, and past historical connections. Harbin, in particular, once had a very important Jewish community; again, the Jewish community worldwide has very positive associations with the Corridor. (A Jewish

synagogue still exists, and Jewish heritage tours to the Corridor are regular events.) These networks should be cultivated.

5. As noted, competing to host the next available Winter Olympics would put the Corridor on the world map, win or lose. This is not an unrealistic aspiration, given the Corridor's track record hosting the Asian Winter Games, etc. To do this, national support would be needed, but perhaps could be realized as part of the Region's revitalization strategy.

THE BOTTOM LINE

The Ha-Da-Qi Corridor has successfully completed Phase 1 of its industrial restructuring. It can be proud of its rapid adaptation to a stable state, the negative impacts of industrial restructuring, including plant closures and downsizing have largely been handled.

It is now time for the Corridor to move on to Phase II – creating a new economic base as the basis for a higher quality of life.

To do this, the Ha-Da-Qi Corridor should not try to restore the past, that is clearly impossible, and unwise at any rate. Rather, a new economic base needs to be created based on the Corridor's considerable comparative advantage. This means implementing a development strategy based on a limited number of *strategic thrusts*, clearly associated with *economic clusters* that have high competitive potential in the Corridor. In this sense, doing less will mean doing more.

The Corridor will only succeed based on local efforts, involving both the private sector and governments. However, realistically, outside forces also need to be catalyzed. External investment and know-how is needed, as is significant policy framework assistance from the national government. In dealing with both these types of outside institutions, well-reasoned proposals need to be developed, set in the context of an overall strategy.

In sum, the Ha-Da-Qi Corridor clearly has the potential to become ***CHINA'S NEW FRONTER***.

5.2 Strengths-Weaknesses-Opportunities-Threats (SWOT) Analysis

The following SWOT Analysis is based on a rapid assessment undertaken over a three-week period in June-July 2006. The analysts visited a wide range of sites (industrial, residential, tourist) in all three major Municipalities on the Corridor (Harbin, Daqing, Qiqihar), and met with several key agencies responsible for development of the Corridor.

All three Municipalities had conducted their own SWOT analysis (based on a methodology put forward at a Workshop in December 2006) before the arrival of the analysts, which greatly facilitated the work. The results of the rapid SWOT below reflect the author's independent viewpoint - there is both overlap and some areas of difference vis-à-vis the locally produced SWOTs.

SWOT analysis is put forward for each of the three Municipalities, then for the Corridor development as a whole. In each case, high priority actions are identified for consideration.

HARBIN

2.1 Strengths

2.1.1 The physical city is an asset, not a liability, with a vibrant and large core. The city is unique, with one of China's largest stocks of heritage buildings, e.g. along Central and Guogeli Streets. Unique buildings and neighborhoods offer great potential for high-end property development, through integration of historical and contemporary design. The riverfront and Sun Island are important amenity assets; importantly much of the river frontage has not been cut-off from the city.

2.1.2 Development is authentic, not glitzy, with an atmosphere of "old China-Russia" along streets such as Central and Guogeli. In fact, Harbin contains one of best and largest collections of nineteenth century and early twentieth century buildings in China. The city has done a good job in preserving heritage buildings to date, basically by leveraging market forces, although in many cases interiors could be put to more appropriate uses.

2.1.3 The winter ice sculpture festival has global profile, ranked with Quebec and Sapporo as one of the top three winter festivals in the world. The Province's "Cool Province" marketing slogan is another example of effective branding.

2.1.4 Relatively high levels of education, and the existence of one of the leading technology institutes in China (Harbin Institute of Technology). However, these advantages have not been translated into economic development opportunities to the extent possible, e.g., commercialization of technology developed at the Harbin Institute of Technology (HIT).

2.1.5 Key national level natural tourism assets are in the Municipality, e.g., forest preserves such as Fangzheng. Within the city and its hinterland is the primary Siberian Tiger base in the world (equivalent to Chengdu's Panda base), the World's longest passenger steam train route (a

potential attractant to tens of million of steam rail fans worldwide). Urban tourist attractions include industrial buildings that could be refurbished as components of mixed-use property developments. Historical areas of interest include 6 of 100 national Red tourist sites, and the Memorial site of the infamous 731 medical experimentation facility

In the summer, the weather is cool, an attraction to urban residents in hot summer cities such as Beijing.

Given the strength of winter tourism, the city attracts 18 million (2005) tourists per year. Although international tourism is limited (204,000 in 2005), a base is being developed among Russian (60,000 visitors in 2005), Japanese, and South Korean tourists in particular.

2.1.6 The Municipality is increasingly establishing a reputation as a winter sports venue. Harbin will host the 24th World University Winter Games in 2009; it hosted the 1996 Asian winter games. Three major downhill ski resorts (skiing is the fastest growing participant sport in China) are located in the Municipality (there are a total of 24 downhill ski resorts in the Province). In fact, the Municipality is the site of China's leading ski resort, Yabuli, the ski site for premier Winter Games.

2.1.7 Harbin is known as a center of music; it hosts (bi-annually) one of the top three music festivals in China, comparable with the Xiamen piano music festival.

2.1.8 Harbin is well known to the leading multinational agri-business companies, who have, or are considering investing there, e.g., Cargill, General Foods, Land O' Lakes, General Mills, and McCain's. This is an area (along with aviation: Embraer) where Harbin has been successful in attracting FDI, and is globally competitive.

2.2 Weaknesses

2.2.1 Because there is limited in-migration to Harbin from other parts of China (as opposed to regional in-migration and returnees), there is limited infusion of new ideas. To a considerable extent developmental thinking is oriented to past developmental models, and past industries, not future prospects and new ways of management, unlike areas with high levels of in-migration, e.g., the Pearl River and Yangtze River Deltas.

2.2.2 The economy is highly dualistic with state enterprises (and former state enterprises) poorly integrated with new private firms. For example, locally headquartered Harbin Electric is a global technology leader in linear motors used in vehicles (each car has an average of 10 such motors); they export to leading auto manufacturers in Europe and North America, but do not supply locally based Hafei, a leading manufacturer of mini-vans in China. This dualistic economy makes Harbin less attractive (locally based supplier firms are a key requirement of most cluster anchor firms), plus the local economy does not benefit from supply-chain linkages.

Although large state enterprises are decreasing in relative importance in Harbin's economy, they are still much more important than in most other large Chinese Municipalities. Given that several of the traditional industrial clusters in Harbin remain viable, particularly pharmaceuticals,

aviation, power equipment, and agri-processing (green food), the dualistic nature of the economy represents a constraint to innovation, more rapid economic restructuring, and higher quality/faster economic development.

2.2.3 Business and professional services are weak, with the partial exception of real estate services, and the emergence of basic advertising/media services.

2.2.4 A high level of out-migration of talented people, particularly recent graduates, exists. In general, the better the educational institute in Harbin, the higher the out-migration rate after graduation. For example in the case of the Harbin Institute of Technology, the out-migration rate after graduation is >90%.

2.2.5 Public policy is hierarchical in orientation, and there is a lack of cooperation among bureaus. This reduces flexibility and adaptation in public responses to issues and opportunities, compared with Coastal China.

2.2.6 Harbin has low disposable income per capita, ranking tenth among ten comparable cities. For example, disposable income per capita is only 58% of Beijing's. In terms of disposal income, Harbin's gap with the coastal cities is increasing, but the discrepancy with Interior and Western cities is decreasing. In other words, Harbin is becoming a more typical non-coastal city, rather than an "outlier" city.

2.2.7 The Songhua River flowing through Harbin is one of the most polluted in China, according to the State Environmental Protection Administration (SEPA). High levels of industrial waste (46 firms have been identified as major polluters) and raw sewage (including in the core city) continues to be discharged into the Songhua River and other water bodies. In addition to health risks and the economic consequences of lower amenity (deterring investment and talent) from water pollution, the late 2005 spill, which resulted in Harbin's public water supply being cut off for four days, damaged the city's national and international image.

2.2.8 Harbin lacks world-class communities, in terms of design and mix of services / activities. High-end residential and mixed property development is needed to attract and retain talent, encourage skilled out-migrants to return, and to support high technology investment. Although relatively high quality urban development is occurring, e.g., the Aijian redevelopment on the site of the former railroad rolling stock work work unit, truly unique eye-catching, exciting urban redevelopment is not occurring. The problem seems to be on the supply side, demand for high quality property appears to exist.

2.2.9 Summer tourism is not promoted or marketed to the extent it could be, given the cool weather, and pleasant lake/hill/wetland summer vistas in the city's hinterland.

2.3 Threats

2.3.1 The flow of vehicles, cargo, and to a lesser extent people, over the Russian border at Suifenhe is difficult, involving bureaucratic hassles; the border is a bottleneck in terms of reaching the Russian market, entry of Russian products and tourists, and accessing the

Vladivostock port. (In 2005, 70,000 people from Harbin entered Russia for tourism and business.)

2.3.2 Harbin will lose airline passengers when Daqing airport opens in 2008. (Daqing accounts for 40% of Harbin Airport passenger flows.)

2.4 Opportunities

2.4.1 Low house prices (top end of the market: 4000 RMB square meter for residential units) indicate significant room for future appreciation, a possible attraction to high-end developers (although it is also an indicator of relatively low desirability of the city).

2.4.2 A bilaterally based cross-border development relationship (seamless crossings) with Russia is likely to be feasible in the short-medium run. The proposed Tumen River Area cross-border development zone is possibly feasible in the medium run. In the medium to longer run, stabilization of the Korean Peninsula, with development of a market economy in North Korea, would open up significant opportunities for Harbin.

2.4.3 As the closest large Chinese city to North America (particularly the West Coast), opportunity exists to attract investment requiring Just-in-Time air freight access to North American cities. For example, high value to weight high technology products manufacturing, such as computer chips and linear motors; and perishable high value food products, e.g., mushrooms and temperate herbs.

2.4.4 Tourism has much potential to grow, given the vast array of under-promoted and under-developed tourist products, e.g., Siberian Tigers, world-class steam train excursions, lakes that could support 5-star hotels (such as resort hotels on lakes in North America, e.g., Banff, Canada), and cool summers. In particular, summer tourism is under-promoted. In addition, significant niche tourist opportunities exist, e.g., Jewish tourism (Harbin was a major destination for "white" Russians).

2.5 Actions

2.5.1 Harbin should position itself as the flagship city of the Ha-Da-Qi Corridor, the Corridor's gateway to the World. It should focus on being more outward in orientation, the gateway to the Pacific coast of North America and Northeast Asia, particularly Korea (Seoul, Korea has pursued and outward looking development strategy since 1998). This is a feasible Vision, given the City's cosmopolitan past and strategic location from an international (especially aviation) perspective, enabling Harbin to counter its less than ideal domestic location. It should play an ever-increasing primate role in the Corridor. Accelerated urbanization should be encouraged; Harbin may be too small relative to the Corridor and Heilongjiang Province.

2.5.2 Take actions to retain a higher percentage of the smartest graduates from technical college & universities, e.g., by supporting provision of fast-track career opportunities in local firms and agencies.

2.5.3 Infuse entrepreneurial attitudes and skills into the educational system. Defuse the "get rich quick" mentality (the example of some members of the elite who have become rich through industrial restructuring distorts the work ethic), replacing it with step-by-step career building and entrepreneurship approach to wealth, based on creation of real value.

2.5.4 Restructure the financial system to lend to young entrepreneurs with viable small business (SME) ideas, e.g., in tourism, health foods, fashion products.

2.5.5 To better compete in the Chinese urban system, deepen a few healthy clusters, particularly aviation, pharmaceuticals, power equipment, and green foods. Accelerate re-structuring in these key clusters, particularly in terms of research and development. For example, Harbin ranks first in China in pharmaceuticals, yet the lead Harbin Pharmaceutical group (which accounts for 89% of pharmaceutical production in the Municipality) spends less than 3% on R&D, and is not competitive internationally. Strengthening of a few clusters that are firmly rooted in Harbin's comparative and competitive advantage should be fostered through improvements to business and investment climates. For example, manufacture of rapid transit equipment might be a new cluster that could be developed. Ingredients for such a cluster include the existence of Harbin Electric (linear motors are used in rapid transit systems), a tradition of manufacturing rolling stock, and strong Chinese demand for rapid transit equipment.

2.5.6 Develop year-round tourism, based on lakes, forests, hiking, health tourism, music festivals. Initially invest (public, private) in Municipal tourism to the south-east of city based on mountains and lakes. (Forest areas to north can be developed more intensively later.)

2.5.7 Deepen winter tourism. As society becomes wealthier, improve facilities associated with new pursuits, such as world-class down hill skiing resorts. The current lead ski resort could be the site of a ski village, with high-end mixed used/condominium development, etc. The 2009 World University Winter Games should be used to position the city for an eventual Winter Olympic Games bid. As skiing becomes more popular, new venues could be developed. (Possible new venues in Heilongjiang include: Pingjing mountain (1429m - about 200km from Harbin); Daqing mountain (952m -100km from city); and Datujingzi mountain (1690 meters, near the Provincial border).

2.5.8 Promote Chinese urban tourism based on the unique built heritage, something different; plus encourage Russian tourism based on shopping. Encourage retailing to move up market; improve shopping environments, especially interiors. There is a need to encourage more compatible uses in old buildings, e.g., higher end restaurants. Although currently contrary to national law, development of a casino could be considered given Harbin's relatively remote location in China (it would significantly reduce national leakages through gambling). A unique local special cuisine could be developed, e.g., Russian – Chinese cuisine.

2.5.9 Develop quality summer tourism facilities, e.g., a 5 star lake hotel, and promote summer tourism, e.g., the steam train, Siberian tigers, etc. To date, summer tourism has been under-promoted

2.5.10 Develop Harbin as an international aviation hub, oriented to Northeast Asia and North America. Given it location on polar great circle aviation routes, Harbin can play a key role as a gateway to North America. (It is 1.5 hours closer to west coast destinations in North America than Beijing.)

2.5.11 Given that high end business, design, and professional services are weak and account for a small percentage of the economy, a study to identify roles/niches in terms of such services should be undertaken, e.g., potential for fashion, regional finance functions.

2.5.12 Take measures, through support to creation of business networks, and through continued reform of SOEs to create a real integrated, rather than dualistic economy.

2.5.13 Revive Harbin's cosmopolitan/global perspective. Promote fusion cultural activities and products. Accelerate language training: five languages: Chinese, Russian, English, Korean Japanese. Build on the fashion consciousness of local people, particularly women, e.g., host high profile fashion shows.

2.5.14 Explore possibility of constructing a "Global Transpark" in Harbin oriented to North American market for JIT and perishable products. Factories would be built along taxiways.

2.5.15 Attract world-class property developer(s) and designers to take advantage of unique Chinese and Russian architectural heritage, as well as the vacuum in terms of high-end property. The price leadership shown by such development would lift the property market as a whole, a concern of local officials and the business community. Such a development would attract local money, as well as investors from Daqing; plus second home purchasers from China and East Asia.

DAQING

3.1 Strengths

3.1.1 Daqing enjoys strong fiscal revenue, given strong corporate tax sharing related to petroleum production. (Daqing generates 75% of Heilongjiang Province's revenues.)

3.1.2 Given the strength of the petroleum economy, GDP per capita is very high (53,000 RMB per annum), per capita household income (a much more accurate indicator of well-being given high regional economic leakages from oil production) is also high at 13,662 RMB (2005) for urban residents. Accordingly, consumer purchasing power is high, reflected in high retail and real estate sales.

3.1.3 Daqing is the leading petro-chemical production and technology center in China. For example, petro-chemical related activities account for 78% of the output of Daqing High-Tech Park (which consists of one main park and three petrochemical parks).

3.1.4 In addition to the petroleum economy, which is currently strong, given fast-growing demand and high petroleum prices, the national level High-Tech Park (which is much more

successful than those in Qiqihar) is acting as an incubator for new firms, and as a site for high-potential, fast-growing firms in agri-processing (e.g., Celestial Nutrifoods, the world's largest producer of high protein soya bean, listed on the Singapore stock exchange), electronics technology (e.g., Daqing Jiachang Technology producing silicon wafers for the European market). In addition, the Municipality as a whole is known for agri-business, particularly its dairy industry (300,000 cows, production for major brands such as Yili and Huier, plus meat packing (well-known brands Jinluo and Ximgfa).

3.1.5 The Municipality possesses considerable human resource capital, particularly in technical areas related to the petroleum sector, but also emerging human resources strengths in electronics (silicon wafers), and food processing. Given Daqing's strong fiscal position it has been successful in attracting educational facilities and talented faculty (through provision of facilities, financial incentives to institutions and talent). Within the High-Tech Zone, there are three leading technical Universities (Petroleum University, Agricultural University, Medical University of Harbin (second campus). In all there, are 58,000 post-secondary students in Daqing (second to Harbin in Heilongjiang Province). There are 50 research institutions employing 10,000 people. Of the 1000 primary and secondary schools, 10 are key schools in the Province. Importantly, approximately 50% of the graduates of the Petroleum University stay in the Municipality after graduating, a very high retention rate for a city of Daqing's size.

3.1.6. Complementing the availability of skilled labor, given high rates of in-migration, relatively abundant low cost labor is available. Some laid-off workers have been absorbed into the service sector.

3.1.7 In terms of physical planning, the built-up city, with a current real population of approximately one million people, is in the process of being transformed into a dual node city (each node with a forecast population of 600,000 within 5 years) from a formerly scattered resource town built around oil wells. Given the strong fiscal position of Daqing, combined with the fact that China Petroleum Corporation operates most urban services, e.g., public buses, waste water systems (it is essentially a "company town"), the physical quality of the city is rapidly improving. In addition to basics, park surrounded lakes have been developed in the eastern node (surrounded by waterfront paths and housing), a significant amenity.

The city is growing quickly based on strong current economic fundamentals (described above) plus the fact that China Petroleum Corporation and the Municipality are implementing a policy to nucleate oil service workers in Daqing city rather than living in dormitories near petroleum production sites.

3.1.8 The city exudes a "Boom Town" atmosphere; entrepreneurship among migrants and public officials is high; giving it an advantage over surrounding cities where the business and government communities are more traditional.

The business and investment climate of Daqing are perceived to be high by outside analysts. Forbes, in its recent article, Finest Commercial Cities 2005: Best Chinese Cities for Setting Up Plants, ranked Daqing as one of the top twenty cities (of 206 assessed) to establish manufacturing facilities in China.

Daqing's investment climate is assisted by the fact that it is perceived by Provincial and National Governments as a pilot city for the transition from a natural resource to manufacturing urban economic base.

3.1.9 Secondary drivers of Daqing's economy include leading middle and secondary schools which attract well-to-do migrants (the three best secondary schools in the Province are located in Daqing). In addition, there is some second home purchasing by non-residents wanting a cool summer residence; as well as investment (speculative) purchasing of housing.

3.1.10 A strong financial sector (banks and insurance companies) is located in the eastern node of Daqing, servicing both firms and relatively affluent households.

3.1.11 There is excellent transportation to Harbin and other points by rail (about 90 minutes travel time to Harbin). The expressway to Harbin facilitates movement of goods; however, the expressway to Qiqihar is not yet complete, although a first-rate highway exists.

3.1.12 The quality of the urban environment is reasonably high, especially visual air quality; however, there is a prevailing odor in the air (common to petro-chemical production cities). In 2005, Daqing ranked 14th in national ratings for urban living quality.

3.1.13 Abundant land is available, based on the Ha-Da-Qi Corridor initiative, 340 square kilometers of land in the Municipality have been designated for industrial use, in addition to regular land quotas for industrial and urban construction use. Given the spread nature of the city, considerable accessible land is available for in-fill.

3.1.14 The Municipality possesses tourist attractions of local/provincial significance/ draw. These include the wetlands conservation area (2/3 in Daqing Municipality; 1/3 in Qiqihar), the only Mongolian Autonomous County in Heilongjiang Province, and hot springs hotels (including a hotel/hot springs complex being constructed in the eastern node of Daqing city).

3.2 Weaknesses

3.2.1 Strong fiscal revenues are not always used effectively enough, e.g., construction of overly large public squares (larger than Tiannamen Square). However, other initiatives are well targeted, e.g., attracting talent to the educational cluster, supporting infrastructure for the successful High-Tech Park.

3.2.2 Rapid growth has resulted in some urban infrastructure backlogs (although not especially serious relative to many other Chinese cities). For example, approximately 70% of non-industrial waste-water is treated. However, the 11th Plan for Daqing identifies five industrial wastewater treatment plans, and 5 civil ones. The water supply system is adequate.

3.2.3 The dispersed settlement pattern (two nodes) has potential to create high transaction costs, especially if traffic congestion between the two nodes develops. However, the fact that the two nodes are specialized reduces negative impacts in terms of innovation supportive environments.

3.2.4 The structure of Daqing's economy results in much lower local Value Added and linkage / multiplier benefits than in comparable global cities, e.g., Edmonton, Calgary, Houston, Dallas. For example, only 15.7 million tons out of the current production of 45 million tons of petroleum extracted annually are refined locally). Secondly, because petro-chemical services are highly internalized within the leading three Chinese petroleum enterprises, there is much less development of oil servicing, R&D, and consulting services than expected. For example, there are only about 55 smaller private companies (with an output of approximately 0.5 billion RMB annually) in Daqing directly linked to the petro-chemical complex. On the other hand, oil pumps are made locally and exported, and oil field servicing firms exist. However, high-end services (e.g., geologically based software for maximizing extraction, exploration) are developing slower than in many comparable and aspirational cities, such as Calgary.

3.2.5. Although Daqing's economy is diversifying (see 3.1 above), the petro-chemical cluster still directly accounts for approximately 65% of the urban economy. Seventy per-cent of employment (300,000) is in petroleum-related sectors. The highly specialized nature of Daqing's economy means that linkages to surrounding geographic areas are weak.

3.2.6 Daqing currently lacks an airport. This results in a commuting cost (to Harbin airport) of 200 million RMB annually. However, an airport, which will serve leading Chinese cities is under construction and will open in 2008.

3.2.7 Daqing's geographic position is not good. It is 1000 kilometers from Dalian and 500 kilometers to the Russian border (in both directions).

3.2.8 River transportation is limited; rivers freeze in winter.

3.2.9 In an increasingly affluent and middle-class China, where the population increasingly prefers amenity regions, the cold climate is an increasing deterrent to investment, in-migration of talent, etc.

3.2.10 Although a 4-star hotel has opened in the Daqing Hi-Tech Park, and a 5-star hotel is under construction, there is currently a lack of services/hotels to support/attract high-end foreign investors, e.g., ready availability of international media.

3.2.11 The local (Municipal) government is weakened by the dominance of the China Petroleum Corporation in the urban economy and urban management. (In effect, the Beijing based CPC has status equivalent to a Provincial Government.) On the other hand, services are generally delivered efficiently, e.g., the extensive public bus system, water supply, by CPC. However, Daqing has grown too large and its economy is becoming too diversified to remain a company town.

3.3 Threats

3.3.1 Oil reserves are running down (only 22% of reserves are left) and production is falling. By 2020, production will be half today's level; by 2030, one-quarter. However, Daqing still

accounts for 40% of China's production. Although Xinjiang is the second most important petro-chemical production base in China, given more abundant supplies of oil and gas in northwest China, new pipelines to Central Asian reserves, the existence of abundant tar sands (shale) deposits, and large supplies of coal for liquification, Xinjiang is poised to overtake Daqing as the leading petro-chemical cluster in China.

This shift in the center of gravity of China's petro-chemical production base is reflected in foreign direct investment patterns, e.g., recently announced large-scale investment by Shell in northwest China.

3.3.2 Daqing is a policy taker in regard to the petro-chemical industry, the Municipality and its residents cannot change national policy. If the petroleum industry, and regulatory environments governing it, are re-structured slowly in China, this will limit developmental opportunities in Daqing, e.g., development of high-end petro-chemical service businesses.

3.3.3 A housing bubble could develop, and collapse, in Daqing. The current housing boom is fed by the new settlement policy (oil field workers are encouraged to live in Daqing), replacement housing (families moving up), and in-migration driven by the diversifying economy, as well as by in-migration to high quality schools (middle, secondary, and post-secondary), and to a lessor extent, by purchasers of vacation homes and investment properties. Large local enterprises are buying blocks of houses to resell at subsidized rates to current and prospective employees. However, it is not clear that the market can absorb the recent increases in housing stock plus construction now underway (four million square meters). The hot housing market is indicated by rapid increases in prices - from 1,500 to 3,000 RMB per square meter for an average apartment over the last three years.

A second concern is that the current high volume of low cost/quality construction may result in large-scale simultaneous deterioration of Daqing's housing stock in approximately 20 years.

3.3.4 Daqing is motorizing rapidly, 130 new vehicles are being added to the Municipality's roads per day. This could result in traffic congestion (so far not a problem), if adequate traffic management systems and infrastructure are not put in place.

3.3.5 Large enterprises are modernizing, increasing production, but not hiring. From an economic and productivity point of view this is desirable behavior, however, the result is limited intake of new labor into enterprises, especially young people. In addition, there are approximately 50,000 laid-off workers in Daqing, although layoffs have probably peaked. Each year 20,000 graduates or school-leavers (from all types of educational institutions) enter the labor force. Daqing would like to retain 50% of graduates; however, to do this, job creation performance will need to be improved. Otherwise, locally produced talent will be lost to other cities.

3.3.6 Daqing is negatively affected by its image as a very difficult place to live and work. Propaganda movies in the 1960s portrayed the hardships of working in Daqing, the current situation in China has turned this image into a negative factor in terms of attracting investment and talent.

3.4 Opportunities

3.4.1 If the petroleum pipeline from Russia becomes operational within the next two years, and supply is guaranteed, this will compensate for losses in local production, feeding a potentially much larger petro-chemical (downstream) refining complex. (Currently 8 million tons of petroleum are imported annually from Russia by rail through Manzhouli.) At any rate, given that only one-third of local production is refined, even with declining local production, there is opportunity to expand refining activities.

3.4.2 Natural gas reserves in the region appear substantial. According to Sinopec, it is likely that three medium or large-sized natural reserves of 60 billion cubic meters (bcm) will be secured by 2008. (Sinopec found a natural gas well in the region in June 2006, which could produce 205,000 cubic meters of natural gas per day.)

3.4.3 The positive business and investment climate provides opportunities for deepening of existing clusters and developing new ones. In terms of petro-chemicals, refining at higher volumes (abetted by the global movement of refining to developing countries) and downstream deepening, e.g., extruded plastics, represent significant opportunities. An opportunity exists to supply Harbin based industries, e.g., extruded plastic and synthetic rubber parts from Daqing for vehicle manufacturing in Harbin. The opportunity to locate lower value added components of supply chains to Harbin industries, e.g., automotive interiors, synthetic rubber parts, in Daqing exists. The auto industry in Chang Chun in Jilin Province represents another opportunity to supply auto parts from Daqing.

3.4.4 Although, as indicated, Xinjiang will likely become the center of the Chinese energy industry, because of its resources, an area of comparative advantage for Daijing, and the Ha-Da-Qi Corridor as a whole is bio-fuels. Heilongjiang is the number one agricultural production Province in China; thus production of bio-fuels, from inputs such as corn, could represent an opportunity; perhaps in conjunction with Qiqihar. In many ways, Heilongjiang parallels the United States Mid-West situation, where dozens of bio-fuel plants are currently being constructed, fueled by corn, and other agricultural products.

3.4.5 Rising oil prices will enable Daqing to compensate, to some extent, for declining reserves through higher prices.

3.4.6 Daqing's location at the middle of the nationally designated Ha-Da-Qi Corridor represents an opportunity in terms of access to national Government support. Daqing is likely to be the biggest net gainer from development of the Ha-Da-Qi Corridor.

3.5 Actions

3.5.1. Daqing should focus on local economic development (LED), utilizing its sizeable fiscal resources. As noted, LED policy should attempt to both deepen clusters, e.g., downstream petro-chemical products, and support emerging new areas, e.g., health foods.

3.5.2 Daqing needs to market itself more effectively, through more precise targeting, e.g., advertising in trade media directly relevant to the emerging industrial structure, e.g., downstream petro-chemical products, health foods.

3.5.3 The unusual urban form of the city can be turned to an advantage if congestion can be avoided (linear/nodal cities have the potential to be highly energy efficient). As an initial step, a protected bus-way (not bus lane) should be developed between the two major nodes. The bus-way could later be upgraded to a light rapid transit system when traffic warrants. (Given the width of the major arteries, this could be accomplished relatively easily, without interfering with vehicle flows.)

At some point, consideration could be given to a diagonal road artery linking the southern end of the western node with the eastern node. However, in the short run, maximum use should be made of existing infrastructure and urban land through in-filling), better traffic management, more compact development, etc.

3.5.4 The National and Provincial Governments should assign stronger powers to the Municipal Government, gradually reducing the power of the China Petroleum Corporation in routine city building and urban management.

3.5.5 Research, development, and production of bio-fuels in Daqing should be considered, given the high agricultural production of Heilongjiang Province.

QIQIHAR

4.1 Status

Qiqihar is the city in the Corridor that is most exemplifies typical “rust belt” dynamics. For example, the population (registered) of the Municipality declined by -0.34% per year between 2000 and 2004 (from 5,596,000 to 5,519,8000). The urban population also declined, but the core city proper less so.

Like Harbin, but to an even greater extent, Qiqihar has declined in relative importance since the reforms of the early 1980s. Before 1984, Qiqihar was the 13th largest city in China.

In urban nodes such as Fulaerji, the consequences of disinvestment are evident, e.g., in the degenerated status of public parks, unusual for Chinese cities.

Although some heavy industrial enterprises are being successfully re-structured, e.g., high quality steel (Beiman Special Steel Group) and digitally controlled machinery (Machinery Group #1), other enterprises, e.g., the chemical complex (Heilongjiang Chemical, QiqiHar Chemical), are encountering more difficulties in re-structuring.

4.2 Strengths

4.2.1 The city has a proud history (founded in 1125) and was the capital of Heilongjiang Province for 254 years. It has long been an important center of culture and economy, where Jilin, Heilongjiang, and Inner Mongolia Provinces intersect. Eastern Inner Mongolian is part of Qiqihar's hinterland, important in terms of agriculture (dairy, meat packing) and tourism.

4.2.2 Qiqihar has highly developed competencies in core, specialized technologies, e.g., digital equipment, lasers, high-end steel products (special alloys), sophisticated heavy equipment (high tensile). On the other hand, some of its firms have encountered difficulties in staying competitive in technical areas where new high technologies have been applied to production of traditional products, e.g., steel making.

Particular strengths are found in the two national level research Institutes, one in the #1 Heavy Industrial Group (turbines, etc.) and the other in Beimen Special Steel Group. And, the #1 Heavy Machinery Group produces state-of-the-art in digitally controlled machinery, retaining and enhancing its competitiveness through a research staff of 10,000, including 3,000 senior science/engineering personnel.

4.2.3 In terms of economic development, Qiqihar appears to have "turned the corner", and its economy is gaining growth momentum. In 2004 the GDP of the Municipality grew at 15.3% and in 2005 at 13.6%, a significant turn-up from relatively low growth rates from the mid-1980s to late 1990s.

4.2.4 There is openness to outside involvement to promote change and accelerate re-structuring, e.g., involvement of firms and technicians from Jiangsu and Hong Kong in upgrading steel technologies at Beiman steel works.

4.2.5 There is an awareness and acknowledgement by the Municipal leadership of the difficulties, issues, and challenges that Qiqihar currently faces. There is a willingness of the population, especially the young, and the leadership, to embrace change.

4.2.6 Qiqihar's hinterland is rich in natural resources: high fertility soils, wetlands (known for the indigenous Cranes), and relatively unpolluted rivers and air. In the north of the Municipality is the largest water reservoir (surface area) at this latitude in the world, ensuring abundant supply of clean fresh water for agriculture, food industries, and domestic use.

In agriculture, a wide variety of green foods are grown (6.4 million mu, or 22% of cultivated land is used to grow green food), as well as hay for livestock and (increasingly less so) export to Japan. Qiqihar is the "capital of green food" in China; having hosted five green food exhibitions (since 2001).

4.2.7. Considerable land is available for industrial development, especially west of Qiqihar core city.

4.2.8 Qiqihar's airport has regular flights to Beijing, Shanghai, Guangzhou, etc. The Municipality boasts good rail services both from the core city and Fulaerji, with connections to Russia, Beijing, Harbin, etc.

4.3 Weaknesses

4.3.1 A very high percentage of the urban economy is in SOEs, or former SOEs in transition. Qiqihar's multi-nodal urban settlement creates high transaction costs and inhibits agglomeration economies. The economy is unbalanced economy, with a minimal service sector, with the exception of retailing.

Industrial clusters are deepening slowly, e.g., high- end digital machinery production is still largely confined to within the formal former SOEs – linked private firms have not yet proliferated despite the strong technical core. The exception may be green food where private entrepreneurship is growing rapidly, with potential for clusters to develop. Marketing and credit access are the two major obstacles are the two major obstacles facing private entrepreneurs, e.g., the new ketchup factory in the Fulaerji Zone has still not secured export markets.

4.3.2. Pillar industries (heavy machinery, steel) are in the process of re-structuring; large layoffs have occurred (about 100,000 people in heavy machinery, but approximately 300,000 continue to work in the sector). Re-structuring needs to be accelerated, and targeted toward leading edge technologies, based on R&D. (The petro-chemical industry faces tough competition, given the dynamism of Daqing's petro-chemical cluster.)

4.3.3 It is obvious that the three major new economic zones (the South Nanyuan High Tech Park of 36.2 square kilometers and the North Beiyuan Economic Zone of 11.7 square kilometers in Qiqihar; and the Fulaerji Zone of 14.7 square kilometers (about 40 kms from the center of the city) lack the dynamism of those in Daqing and Harbin. This is especially true of the Beiyuan zone, which lacks a critical mass of dynamic firms, cluster dynamics, etc. The new Fulaerji Economic Zone has ambitious plans, has been successful in attracting a set of dynamic private enterprises, and may prove successful, especially in areas such as green food; provided it can raise needed capital for infrastructure.

4.3.4 Spatial development is scattered, and spatial plans do not advocate enough spatial focus. This is especially serious given population decline in the Municipality. There is a need to focus on a limited number of settlement – industrial nodes along the proposed outer ring road, Fulaerji being one, and connect the key nodes to each other, and to the core city. Given slow population and employment growth, attempts to develop all 7 nodes and a complete outer ring road are likely to dilute positive impacts from investment.

4.3.5 Large local enterprises are commendably engaged in rapidly improving productivity; however, this limits employment creation. The result is that the economy is growing much faster than employment. Qiqihar should accordingly focus on retaining talent to grow new businesses, and encourage entrepreneurship through an improved business climate, especially in terms of access to credit. The emphasis (and expectation) should not be on rapid population growth, but

on improving the quality of the economy, and consolidating spatial development around a limited number of settlement nodes associated with specific economic clusters.

4.3.6 Lack of international standard services, e.g., 5 star hotels, international media, reliable telecommunications, high quality residential developments, etc., is a serious constraint to attracting FDI in areas of potential interest, particularly agri-business, and possibly digitally controlled intermediate machinery.

4.3.7 Qiqihar lacks effective marketing and promotion. There is a lack of promotional materials, e.g., brochures, CDs. There is little targeted marketing to potential investors, e.g., major agri-business firms. The Crane / Wetlands image is suitable for tourism, but not for wider development, i.e., investment promotion and recruitment/retention of talent.

4.3.8 Given high levels of out-migration, there is a lack of broad-based training (possibly through a major training facility) to prepare labor for organized out-migration and subsequent remittances that could benefit Qiqihar significantly.

4.4 Threats

4.4.1 The emergence of high performance competitors, particularly Daqing. Qiqihar is especially vulnerable given its westernmost location on the Ha-Da-Qi Corridor, its heavy industry economic structure, and its relatively low fiscal resources (especially compared with Daqing which has at least 3.5 times the fiscal resources).

4.4.2 The difficulty in attracting and retaining talent (climate, old industrial image, etc.) could make revitalization, leading to a competitive economy, difficult.

4.4.3 The current growth pattern is non-sustainable, based on low profits on high investment, and high pollution.

4.5 Opportunities

4.5.1 The re-emergence of the importance of heavy and intermediate industries (from 2002) in China to manufacture inputs for industrialization ("factory of the world") and major investment in energy infrastructure. Accordingly, heavy equipment and machinery demand is high in China, but state-of-the-art products are increasingly demanded, e.g., in terms of energy efficiency, digitalization.

4.5.2 An increasingly affluent and environmentally aware Chinese population is creating fast growth in demand for green food. Given Qiqihar's emergence as a green food center, this represents a significant opportunity.

4.5.3 The rapid growth of the middle and upper-middle classes in urban China, and urban East Asia as a whole, is creating demand for specialized labor-intensive services, e.g., nurses, house-keepers, prepared restaurant and take-out food, to save time of busy urbanites. This creates an opportunity to export trained labor, e.g., nurses, to meet demand in urban China, and compete

with Filipinos globally. Remittances from properly trained labor to Qiqihar would be very large, much larger than remittances from unskilled labor, the current norm. Out-migration should be viewed as a positive opportunity, not a problem. (In the United States and Europe, a major policy tool in revitalizing old industrial areas has been out-migration.)

4.5.4 The Opportunity to develop a major cluster to produce bio-fuel could exist in Qiqihar, given the abundance of potential bio inputs, e.g., corn, plus the local history of coal liquification. Qiqihar and the Ha-Da-Qi Corridor as a whole enjoy comparative advantage in bio-fuel production, not coal liquification (where Northwest China enjoys comparative advantage). Bio-fuel production could involve intra-Corridor co-operation between Qiqihar and Daqing. (In the United States, dozens of bio-fuel facilities are currently being developed in equivalent corn producing areas, e.g., Iowa State.)

4.5.5 The rail rolling stock production tradition could possibly be matched with linear motor technology and production in Harbin, to develop an LRT / Subway rolling stock cluster, given high forecast demand in China for such equipment over the next two decades.

4.6 Actions

4.6.1 Qiqihar should modify its physical plan to accept the fact that it will grow slowly demographically. Only a few nodes should be emphasized, particularly Fulaerji and the Core City, and development of the outer ring road should be staged to focus on these nodes.

4.6.2 There is a need for investment in basic infrastructure, e.g., central urban heating, wastewater systems, to ensure delivery of basic services in built-up urban areas.

4.6.3 The Qiqihar Municipal Government should actively target the private sector to develop facilities (a 5 star hotel) and services (international media, broadband and wifi internet services) that would be attractive to international investors.

4.6.4 Qiqihar should develop basic marketing materials, e.g., English language brochures, CD Roms, internet sites. For example, the promising Fulaerji economic zone lacks an English language brochure. Qiquihar should develop a Vision, clearly identifying what the city stands for, and project this image through targeted marketing; the Crane image is obsolete, given the limited tourist potential of the Municipality.

4.6.5 Above all, Qiqihar should focus on quality of growth, not the quantity.

THE HA-DA-QI CORRIDOR

5.1 Status

The Ha-Da-Qi Corridor is the economic and demographic heart of Heilongjiang Province. Although it contains only 27% of the land area (124,000 square kilometers), the Corridor accounts for 68% of Provincial GDP, and 50% of the population (19 million).

The official objectives are to develop the Corridor as: (i) a modern manufacturing base, (ii) China's green food base, (iii) China's logistic hub for Northeast Asia, (iv) a specialized tourism base focusing on natural scenery, (v) a zone for pioneering new technologies, (vi) an ecological demonstration area, and (viii) as an outward oriented regional economic and technical cooperation base in Northeast Asia.

The short-term economic objective is to achieve a Corridor GDP of 600 billion RMB and per capita GDP of USD $3,000 by 2010. The medium term objective is to achieve a GDP of 1,300 billion RMB and per capita GDP of USD $5,000. by 2020.

5.2 Strengths

5.2.1 High levels of Provincial policy support to the Corridor. The Provincial government is focusing fiscal and infrastructure resources on Corridor development (The Province has a 5 hour access target for surface transportation within the Province, with the exception of Da Xing An Ling Prefecture).

5.2.2 The Corridor is over 50% urbanized in terms of population (The national urbanization level is 42%).

5.2.3 The population of the Corridor is highly educated. The Corridor ranks seventh of all major urban areas in China in terms of educational achievement, 20% of the population have received some type of specialized (normally post-secondary) vocational, academic, or professional education. The Corridor is well endowed with educational facilities, there are 55 post secondary educational institutions and 831 research institutions, given the Corridor's history as a leading industrial core of China from the 1950s to early 1980s (and earlier under Japanese and Russian occupation).

5.2.4 There is reliable, comfortable, fast, frequent passenger rail transportation along the Corridor. Good passenger and freight rail access to major Chinese cities, and Russia, exists; although rail freight bottlenecks occur at certain times of the year.

5.2.5 Inexpensive land is abundant, e.g., the industrial land base price in Harbin is between 162 and 215 RMB per meter. Throughout the Corridor there are 824 square kilometers of saline land, which is available for urban and industrial uses, although it would be a mistake to uneconomically locate industrial parks solely on the basis of availability of saline land, given the overall abundance of land in the Corridor.

5.2.6 The Corridor enjoys relatively high air quality, especially for an industrial region. Strong, consistent winds contribute to high air quality (and represent an opportunity to develop wind power).

5.2.7 Heilongjiang Province has the highest level of agricultural production in China; an obvious strength in terms of advanced food production in the Corridor.

5.2.8 The Corridor has an industrial legacy. Skilled production workers exist in specific areas, e.g., heavy machinery, hydro-electric equipment, railroad rolling stock. However, in some cases the industrial legacy is a weakness, e.g., out-dated approaches to production. Nevertheless, unlike in Coastal and Western China, private firms are willing to hire laid-off industrial workers, e.g., the majority of industrial workers in high-tech Harbin Electric have a SOE industrial background.

5.2.9 Labor is inexpensive, both by Chinese and Northeast Asian standards. In general, labor costs about one-quarter the Beijing or Shanghai rate, one-tenth the South Korean rate, and one-fifteenth the Japanese rate.

5.2.10 The Corridor enjoys a "late comer" advantage in terms of the market economy. It has the potential to learn from development dynamics of other areas of China, particularly coastal areas, e.g., the Pearl River and Yangtze River Deltas, that opened up earlier.

5.3 Weaknesses

5.3.1 The existing economic geography of the Corridor reflects past locational decisions based primarily on geo-political rather than economic criteria, particularly in the case of Qiqihar. In particular, during the early Communist period, state policy favored location near the Russian border. In the case of Daqing, its development success to date is obviously based on the location of natural resources (petroleum and natural gas); the efficiency of Daqing's location for other types of economic activities is more problematic. Overall, the Corridor's cities may no longer be in the most economic locations vis-à-vis the overall Chinese and East Asian economy.

5.3.2 Economic linkages among the Corridor cities are weak. Daqing and Qiqihar interact directly with Beijing to a substantial extent, given their economic reliance on state enterprises. Freight flows in/out of Corridor cities are overwhelmingly to other destinations in China, not intra-Corridor. Although intra-Corridor passenger flows are more substantial, increasingly people in the Corridor are deepening business, professional, and personal linkages with other parts of China. For example, the opening of the new Daqing airport in 2008 will increase Daqing's direct relationship with other major Chinese cities.

5.3.3 Selective out-migration of talent, especially recent graduates is a major concern. The better the University in the Corridor, the more likely its graduates are to leave. For example, in the case of the Harbin Institute of Technology, more than 90% of its graduates leave the Corridor immediately upon graduating.

5.3.4 The performance of the Corridor in attracting Foreign Direct Investment (FDI) is extremely poor, the lowest of any major urban region (sub-provincial cities) in China. For example, it is one-eighth of Dalian, one-seventh of Shenyang, and only 60% of Chang Chun (the capital of Jilin Province.)

5.3.5 Hospitality services (hotels, convention facilities), telecommunications, foreign language proficiency (especially English), access to international media, and business and professional

services, are very weak outside Harbin. Yet these services are critical in attracting high-end domestic investment and FDI.

5.3.6 The three major Corridor municipalities compete economically with each other and inter-firm linkages between cities are minimal, including in areas with high potential for co-operation such as agri-business, e.g., dairies, noodles, soya bean products. This limits deep cluster formation, which would result from greater specialization among Corridor cities.

5.3.7 Economic zones in Corridor Municipalities compete to attract investment, with a confusing array of incentives. Combined with an oversupply of industrial land (with the exception of high end industrial and high-tech zones in Harbin), this situation is attractive to speculators but confuses serious investors. "Race to the bottom" dynamics are too frequently the norm in terms of development and promotion of industrial zones in the Corridor.

5.3.8 Firms are economically and technically isolated because of very poorly developed upstream and downstream supply linkages. This is the prime complaint of private sector high technology investors who need well-developed local supply chains to grow, and often just to survive. Throughout the Corridor a dualistic economy exits whereby firms in the SOE (or former SOE) and private sectors do not work together to create clusters, e.g., as indicated in the example of the linear motor and vehicle industries in Harbin. A lack of developed industrial associations within the Corridor that would incorporate both SOE and private actors constrains action to remedy the situation, as does slow re-structuring of SOEs in terms of procurement practices.

5.3.9 Despite the existence of high-quality universities (particularly the highly ranked Harbin Institute of Technology, and specialized highly respected tertiary institutions, e.g., Daqing Petroleum Institute), engineering follow-up and commercialization of technology capabilities are limited, compared with universities in the coastal area. For example, faculty at Zhejiang University, one of the best in China in terms of academic-industrial linkages and commercialization of innovation behave much differently, in this regard, than faculty at HIT.

5.3.10 The Corridor lacks a high profile and identity, both domestically and internationally. The Corridor is not marketed or promoted. The extent to which the Corridor has an image, it is as an "Old Industry Corridor", not a modern Economic Corridor.

5.3.11 Provincial leadership is attempting to develop the Corridor more from a supply-based approach (availability of land and land quotas; development of industrial and high tech zones) than a demand based one. A demand-based approach would focus on business and investment climates, support to emerging high potential clusters, optimal location for industrial parks (rather than availability of inexpensive saline land), targeted marketing to investors, etc.

5.3.12 Existing (and former) SOEs often have high liabilities related to pensions, laid-off employees, loans, etc. This limits their ability to upgrade technology and production processes, relocate, etc.

5.3.13 Many large enterprises stress productivity increases, a positive policy, but this limits employment creation in the Corridor, potentially limiting opportunities to retain new graduates, etc.

5.3.14 Many industries in the Corridor are highly capital/technology intensive, e.g., the petro-chemical cluster, limiting employment creation to absorb new labor force entrants and thereby encouraging out-migration.

5.4 Threats

5.4.1 The political and economic future of Korean Peninsula is unknown. Major instability in Korea would have negative economic impacts on Northeast Asia, and constrains cross-border based development.

5.4.2 Eastern Russia lacks a diversified economy, being primarily a resource and port-based region. Thus opportunities for trade and cluster development, outside the natural resource, agriculture, tourism, and logistics (port) areas are limited.

5.4.3 Competition from neighboring provinces is increasing. Jilin, Liao Ning, Dalian, and Shenyang Provinces offer intervening opportunities for FDI; they are closer to the Chinese economic heartland. The latter are on the Bohai Rim, which is becoming increasingly important in Chinese economic development.

5.5 Opportunities

5.5.1 The potential exists to extend the Corridor to the south-east to the Russian border at Sui Fen He (Russian trade, tourism, port access). (Heilongjiang Province achieved a total export and import volume of USD $5.68 billion with Russia in 2005, a year-on-year 50% increase. Heilongjiang Province accounts for one-fifth of China's total trade with Russia. In terms of Heilongjiang's total foreign trade, 60% is with Russia.)

5.5.2 The possibility of Daqing – Qiqihar co-operation in certain energy areas, particularly bio-fuels.

5.5.3 The possibility of Corridor co-operation in development and manufacture of rapid transit rolling stock development, including between Qiqihar and Harbin.

5.5.4 The possibility of value chain specialization along the core, as in Fujian Province, based on varying factor costs, particularly for land and labor. For example, assembly of vehicles could occur in Harbin while extruded plastic and rubber parts could be manufactured in Daqing.

5.5.5 High agricultural production offers significant, currently not fully exploited, opportunities for agricultural value added activity.

5.5.6 The possibility of Corridor-based co-operation in agri-business, the one economic commonality along the Corridor; and the one economic sector in the Corridor attracting attention

from global leaders, e.g., Carghill, General Mills, Land O'Lakes, McCain's, Maple Leaf, and Hamer.

5.5.7 Stability in the Korean Peninsula would dramatically improve the Corridor's geo-strategic economic opportunities.

5.5.8 The Corridor is near eastern Siberia, one of the world's last-remaining relatively unexploited natural resource regions. As commodity and energy prices continue to rise, the value of this opportunity will increase.

5.5.9 The Corridor is on the great circle (aviation) route to North America from much of East Asia, e.g., Beijing, Bangkok, Singapore. The Corridor is the closest major Chinese urban agglomeration to North America. (Vancouver, Canada occupies a corresponding position in North America.) This geostrategic location offers particular opportunities in terms of high value: weight/bulk goods, e.g., high-tech electronic items, that are suitable for air freight.

5.6 Actions

5.6.1 Harbin's importance on the Corridor should be increased, it is the only urban center capable of delivery of most high level services in Heilongjiang. Harbin should be developed into a sophisticated global gateway, acting as the flagship of the Corridor. Daqing and Qiqihar's economies stand to benefit from the development of the
Corridor, especially Daqing, however, their relative importance in the Corridor will decline vis-à-vis Harbin; thus their roles are likely to be defined in relation to Harbin, which will be the pace-setter for the Corridor.

5.6.2 The Corridor's development should be urban based, and planning should focus on economic, not just industrial development. Urban-based business, professional, hospitality, technical, and telecommunications services need to be developed; their current low state of development weakens the Corridor's competitiveness. Tourism in Harbin Municipality, and beyond, particularly to the south-east, has high unexploited potential. Tourism should play a key role in developmental planning for the Corridor, including its possible extension to the southeast.

5.6.3 Consideration should be given to extending the Corridor to the Russian border through Mudanjiang, crossing at Suifenhe. Implementation of a "seamless" cross-border customs/immigration agreement should be accelerated. This would position Harbin at the top of the "T" intersecting with dominant Northeast China Harbin – Dalian Corridor. A Harbin – Vladivostock international Corridor would have considerable potential in terms of trade, tourism, technology, manufacturing complementarity (e.g., wood products), agriculture, plus give Harbin access to a close deep water port. The Inland Container Terminal, being constructed in Harbin, could play an important role in terms of shipping through Vladivostock.

5.6.4 Although the Corridor is already significantly urbanized, considerable rural – urban migration is yet to occur (according to our calculations, about 5 million people will leave rural areas in Daqing, Qiqihar, and Harbin over the next 20 years). To the extent possible, this rural-

urban migration should be directed to the three major centers on Corridor to increase their agglomerative advantages.

5.6.5 Encourage the location of lower value chain activities, and less clean industries, in urban centers on the Corridor, away from Harbin, e.g., Zha Dong.

5.6.6 Increase the efficiency of transportation (expressways, rails) along the entire Corridor.

5.6.7 Physical development of the Corridor should be nucleated around a few key centers, in particular Harbin, Daqing, and Qiqihar (based on international learning), not diffused along the length of the Corridor. All cities on the Corridor need well-defined revitalization strategies based on specific Corridor roles, to be implemented with strategic intent. Local fiscal spending should be aligned with local economic development strategies. City development strategies need to be consistently implemented over time, conflicting / changing developmental signals are harmful to local economic development.

5.6.8 Concentrate development on existing economic zones where there is ample space, rather than engaging in a supply-led proliferation of new economic zones. Stress the quality of economic zones, rather than quantity or inexpensiveness of land. Locate zones according to economic criteria, not the lowest cost land. At the same time, Class 1 agricultural land should be protected from urban land conversion. Learn from the experience of the Pearl River Delta to develop a more rational pattern of industrial zones.

5.6.9 The Corridor should not be regarded as a set of new industrial zones, but rather should be based on strengthening starting from the current situation. Corridor development should be based on improving business and technology networks, infrastructure, industrial zones, and economic clusters that already exist. New industrial zones should only be built when and where needed. With the exception of high quality economic zones in Harbin, there is already a surplus of industrial land in the Corridor.

5.6.10 Lobby for an increase in flight frequencies to North America to achieve a critical threshold (ideally at least one flight per day), which could set off a virtuous circle of passenger / freight flows (current flights by China Eastern to Los Angeles are seasonal). Lobby China Eastern and other relevant airlines interested in the route. Co-operate with airline companies in promoting the Corridor.

5.6.11 Market and promote the Corridor as an Economic Corridor, not an Industrial Corridor. To do this, a Vision, Logo, and targeted marketing strategies need to be deployed.

6. China CDS: Ha-Da-Qi Corridor Strategy Options

By James Gollub, ICF International[10]

Executive Summary

Introduction and Objective

The Ha-Da-Qi Corridor is a geographic area in northeast China encompassing the municipalities of Harbin, Daqing, Qiqihar, Zhaodong, and Anda, that has been designated a targeted zone for economic development by the Heilongjiang Province. Corridor development is currently being assisted by a set of specially-legislated Provincial policies focusing on land use, finance, innovation, and investment. The Province has established a Ha-Da-Qi Corridor Office with a modest staff that is primarily responsible for overseeing the implementation of these policies.

The Heilongjiang Province now has the opportunity to consider how best to expand the Ha-Da-Qi Corridor's organization and policies in order to accelerate development. This report offers a framework and emerging set of strategic recommendations for enhancing and managing Ha-Da-Qi Corridor growth based on the cluster-based collaborative economic development and proven in ICF International experience in over 50 regions worldwide.

The ICF Framework for Corridor Development

Five principles of economic development guide how the most competitive economic regions build and sustain competitiveness. These five principles should also be the guide for strategic decisions pertaining to the Ha-Da-Qi Corridor in the future. The reasoning of each principle is simple, but their impacts are far-reaching. When applied effectively, they offer a way for businesses, institutions, and agencies on the Corridor to work together in order to identify the shared challenges they face in the Corridor, prioritize strategic solutions to these challenges, and implement these solutions collaboratively so that each business and organization contributes a share of the solution—and reaps the rewards. If applied effectively these five principles offer a way for the Corridor to grow and sustain its competitiveness on an ongoing basis over time. The principles are as follows:

1. Leverage Assets across Jurisdictions in a Regional Manner

Geographic regions, not political jurisdictions, define where economic development takes place. The Corridor is a geographic region that is the sum of its constituent metro-regions, and thinking regionally on the Corridor means that planning and delivering regional economic inputs is an integrated task that requires convening the institutions, industry, agencies, and all other Corridor players across jurisdictions. Planning collaboratively at the regional level also enables authorities to better manage the complex relationships between economic development, environmental sustainability, and social well-being. Region-wide planning efforts should seek to ensure that industrial development occurs in concert with improvements to transportation infrastructure and housing stocks, and that significant emphasis is placed on environmental sustainability and social equity issues. Finally, planning and organizing initiatives at the regional level enhances the ability of the Corridor to market itself, based on a set of attributes and assets shared across municipalities, and a clear vision for the region.

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2. Identify and Focus on a Portfolio of Clusters

Industry clusters across the Corridor should be the focus of strategy. Clusters are agglomerations of firms that produce and ship similar products or services and use similar inputs produced by public and private institutions, such as human resources, financing, innovation, and infrastructure. As clusters develop they become the engines of the economy because of the value they generate as well as their contribution to economic stability. Clusters comprise groups of similar but competing and exporting enterprises that produce economic diversity that helps make the Corridor economy more robust and able to respond to market changes. Healthy clusters attract suppliers that create depth in the value chain and thereby generate and retain more economic value in the region. A cluster-based economy tends to generate diverse, higher value-added, economic outputs and is consequentially better able to adapt to economic cycles, than an economy that has only a handful of large employers—particularly state owned enterprises (SOEs).

A cluster can be made up of a combination of both private firms *and* state-owned enterprises, but should shift over time to emphasize private enterprise. In each of the Ha-Da-Qi Corridor's clusters there are key state-owned enterprises that can benefit from participating in cluster strategy. The participation of the SOEs in the activities of individual cluster strategy through future Ha-Da-Qi Corridor initiatives, which will be discussed in subsequent sections, can be valuable to SOEs just as it is to private-sector firms. Participation in a cluster organization creates opportunities for all companies, whether private or state-owned. A cluster organization allows firms to develop linkages that will improve the quality of important inputs and access to key markets, thus improving firm competitiveness *and* overall cluster competitiveness. Collaboration with other cluster members can also enable SOEs to diversify their activities, build partnerships with smaller firms and foreign firms, and, in some occasions, establish joint-ventures and spin-off companies.

3. Create Advantages in the Economic Foundations

Clusters only take shape and grow in regions where they derive specific competitive advantages. This is true for most individual enterprise in a market economy. Companies grow where the overall set of advantages are greatest. In a market or mixed-market economy, when companies learn why others have formed, expanded, or located in a specific region this attracts more firms to come. There are ten main categories of economic inputs, or "economic foundations," around which a region can create competitive advantage for its cluster industries. These are: Innovation, Human Resources, Finance, Land Use, Governance, Transportation and Logistics, Power and Utilities, Environment, Quality of Life, and Marketing. To enable the growth of their clusters, the providers of these economic foundations—whether national, provincial, municipal, public, or private—must work together to create advantages that align with the needs of the Corridor's target clusters. Failure to understand cluster-specific economic input needs and ensure the responsiveness of diverse public institutions and agencies to cluster needs will result in companies not growing, moving away, and not entering the Corridor.

To be successful, the development of the Ha-Da-Qi Corridor will need to include *not only* investments in factors directly supporting industrial cluster growth such as land, finance, and workforce, but *also* broader investments in housing, healthcare, transportation, recreation and entertainment, and environment. These region-wide inputs are crucial for the Corridor's

economy. For example, industrial growth without appropriate housing development will not succeed and create negative consequences for the Corridor. Corridor-wide thinking about inputs needed by industry and community are essential—whether housing, water and waste or transportation. These cross-Corridor needs must be invested in, improved, and their quality sustained in the Corridor in order for economic development to be successful.

4. Collaborate to Create Advantages

High performing regions are characterized by their ability to work together across municipalities as well as across companies and between industry and institutions. Collaboration enables a region to create economic input advantages for its clusters that will grow the regional economy. Collaborating regions are also able to make shared decisions, pool resources and make strategic investments that improve the soft and hard infrastructure for the entire economy. High-performing regions are characterized by a collaborative culture, whether business-to-business, business-to-institution, or institution-to-institution. Poorly performing regions are characterized by isolation and competition between neighboring municipalities and zones or between cluster related companies. This leads to fragmentation of policies and inefficient resource allocation. Yet, when markets are national and global, there is no value in local municipalities, zones, or industries ignoring or fighting each other. In the Ha-Da-Qi Corridor having many state-owned-enterprises based in Beijing can often make finding common regional interests more difficult. Yet, even for SOEs, collaboration within the region can enable harnessing of important resources possible. SOEs often recognize the value of creating specialized capabilities in a region, although these may sometimes need to be national centers of excellence. Thinking and acting collaboratively across the Corridor will enable the Province to coordinate as well as concentrate resources needed for cluster development. Working collaboratively across the Corridor, rather than competing locally, can also enable better planning and harnessing of Provincial and local resources. Thinking and collaborating along the Corridor distinguish the Corridor globally.

5. Use a Formal Corridor Partnership to Enable Growth

Successful economic regions recognize that there is a need for a coordinating or "bridging" organization to facilitate planning and management of cross-region activities. There are many different types of regional or corridor organization mechanism possible. However, the successful models all use a partnership structure that brings industry representatives and economic input providers together in a collaborative organizational structure. Therefore, in order to create the collaborative advantages needed to accelerate Ha-Da-Qi Corridor growth, ICF believes that an entity with the title of the Ha-Da-Qi Corridor Development Authority should be established by the Province, building on administrative capabilities and policies already in place. This entity can be a formal or informal network that would convene delegates on a regular basis from the output side of the economy (each of the Corridor's clusters) and the input side of the economy (provincial agencies and agencies from each metro-region along the Corridor, including the universities, transit providers, financial institutions, research institutes, utilities, and all agencies in environment, recreation, housing, and healthcare). The Ha-Da-Qi Corridor Development Authority would convene both sides of the interested parties concerned with the Corridor to help plan policies, programs, and investments for the Corridor.

The processes recommended for the Corridor Authority include three steps: (a) Define Corridor challenges—have industry and public institutions work collaboratively with Corridor Authority

guidance to identify the most important challenges facing each cluster individually and the Corridor as a whole. (b) Identify Corridor actions—under Corridor Authority guidance have industry and public institutions consider best practices and propose solutions to these challenges. (c) Propose collaborative strategies—have industries and agencies agree to support and work together, where appropriate, on specific Corridor actions; or at a minimum agree to support specific new Provincial policies and programs. Such a delegation of stakeholders working under Provincial guidance would create strong market-driven perspectives on Corridor development and avoid the fragmentation of traditional planning efforts among individual municipalities on the Corridor. Beyond using this approach to define the Corridor directions, ICF proposes that the Ha-Da-Qi Corridor Development Authority become the vehicle for bringing together the Corridor's stakeholders on an ongoing basis in order to make the collaborative decisions that will improve the Corridor's competitiveness in the global economy.

Corridor Cluster Portfolio Assessment and Options

As stated in the introduction, ICF recommends focusing on the Corridor as a region emphasizing development of clusters to achieve a diverse and robust economy. To guide strategic planning and action, therefore, the Ha-Da-Qi Corridor needs to understand the structure, competitive position, and needs of each cluster in its evolving economic portfolio. The following is a *preliminary* assessment of the current industrial makeup of the Ha-Da-Qi Corridor, intended to inform the Corridor's identification of the industries that drive its economy. Such economy-driving industries must be the target of specifically-defined input advantages that will help them grow and succeed on the Ha-Da-Qi Corridor. For each industry we have identified strategic options that, if implemented effectively, will help create advantages for these industries and promote their growth on the Corridor.

Each industry reviewed is ranked with a cluster candidacy value (High, Medium, or Low) based on its overall potential as a target cluster for strategic growth on the Corridor. Though the high-level candidates represent the highest potential for growth, *all* clusters on the Ha-Da-Qi Corridor—regardless of their concentration or strength or stage of lifecycle—are part of the region's cluster "portfolio" and therefore should be represented in the Ha-Da-Qi Corridor Development Authority, which can serve as the convener of the Corridor's marketplace.

Energy (Extraction, Refining, & Services)

Cluster Candidacy Level: High

The energy industry has historically been a major focus of economic activity on the Ha-Da-Qi Corridor, particularly in Daqing, where energy constitutes over 90 percent of the city's gross industrial output.[11] The energy industry—in particular gas extraction—has the potential for strong economic development across the Corridor. The energy industry should develop linkages upstream and downstream along the value chains of the oil, gas, and refining industries.

In oil extraction, it will be essential for the Province to ensure that access exists to Russian crude via pipeline, and it will be valuable to consider reversing the pipelines that carry Daqing crude to coastal refineries to allow Daqing to process foreign crude. In the gas extraction industry, the Corridor should consider expansion into power generation to displace coal to provide a clean-

[11] 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar.

burning alternative fuel source; residential or commercial applications primarily for space heating; and feedstock for petrochemical production.
In refining, the Corridor should identify ways to utilize existing unused refinery assets for greater economic benefit, possibly through increased production of petrochemical feedstock, intermediate products, or fuel products coincided with the opening of the product pipeline and depot system to supply northeast China. The implementation of any of these strategic options will require a new form of collaboration among the marketplace of players in the energy cluster, and ICF recommends the establishment of an energy cluster organization to convene the industry's "marketplace."

In addition, the Corridor can consider utilizing existing infrastructure to expand into the coal and shale oil industries, which currently do not have a presence on the Corridor. Regarding the coal industry, though this industry does not currently have a presence on the Corridor, it could be considered in the future. Because the Corridor has very strong expertise in other processing capability and in the value chain-supporting process industries, the region may be a candidate for location of a coal-to-liquid (CTL) facility. As for the shale oil industry, this industry does not exist on the Corridor, but it does exist in Mundanjiang, so the Corridor could consider working collaboratively with the provincial institutions and CNPC to develop shale oil production stemming from the new discovery in Mundanjiang.

Metal Fabrication & Heavy Equipment
Cluster Candidacy Level: High
Metal fabrication and heavy equipment have a major presence in the Ha-Da-Qi Corridor, particularly in Qiqihar and Harbin, where the industry represents 45 and 39 percent, respectively, of gross industrial output.[12] The industry is a very important supplier to the Corridor's other industries; these synergies should be accentuated along the Corridor in order to strengthen the competitiveness of this industry, particularly against international competition. One potential area for growth could be in machinery and equipment to improve energy efficiency for businesses and consumers (e.g. efficient furnaces, water heaters, distributed generation equipment, etc.). Interviews have indicated there may be competitive disadvantages on the Corridor in quality of equipment versus global companies who could be supplying CNPC and other manufacturers. The competitiveness of the metal fabrication and heavy equipment industry will require aggressive modernization of equipment, capital, and skills, and constant assurance of both product quality and a match to end-user needs.

Agriculture (Primary & Value-Added)
Cluster Candidacy Level: High
Agriculture (primary and processed foods) is a major strength of the Heilongjiang Province economy, particularly in the Harbin and Qiqihar regions, where agriculture represents 28 and 26 percent of each metro-region's respective gross industrial outputs.[13] Growth of primary commodities will continue particularly with enhanced productivity enabled by improved technologies, but relative growth of this industry will be higher in value-added processing, which is just beginning to grow (e.g., soy powder). Agriculture is fundamental to a number of other industries on the Corridor—particularly emerging areas such as bio-fuels and bio-products (e.g.,

[12] 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar.
[13] 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar.

consumer nutrition and industrial chemicals, such as bio-pesticides). The industry should increase its examination of ways to use corn, wheat, and soy to produce consumer goods, while at the same time maximizing the value of what is produced from the existing soil. Strategic options for the industry include expanded R&D to increase crop yield per acre under environmentally balanced conditions; improving human resources for research into bio-fuels and bio-products; and collaborating with Western companies to develop processing and packaging consistent with Western standards.

Chemicals (Commodity & Specialty)
Cluster Candidacy Level: Medium
The chemicals industry is a comparably-sized portion of each of the industry portfolios of Daqing, Harbin, and Qiqihar (ranging from 2.8 to 3.6 percent of each city's gross industrial output).[14] There is medium potential for growth of commodity and intermediate production in the Ha-Da-Qi Corridor. This industry must identify ways to capture and retain the high-demand, value-added activities for petrochemical derivatives and consumer goods, rather than exporting petrochemicals as commodities to other parts of China. Strategic options might include refinery projects; the conversion of coal to liquid or gas to liquid projects that result in added petrochemical supply; and the development of petrochemical supply from bio-based industries. Such diversification and growth in the derivative chemicals and consumer goods markets will require new collaboration between the upstream sourcing and the downstream consumer requirements.

Pharmaceuticals
Cluster Candidacy Level: Medium
The pharmaceuticals industry on the Ha-Da-Qi Corridor exists primarily in Harbin, where there are 45 companies and 26,866 people employed, and the industry makes up 7.9 percent of the city's gross industrial output.[15] The pharmaceuticals industry has a medium-level potential for economic growth on the Corridor. A key priority for this industry will be to grow its value-added segments. Possible linkages between the pharmaceuticals and bio-products industry should be strengthened for the competitiveness of both industries. Adding capacity for pilot and contract manufacturing of new drug developments may assist the Corridor's as-yet early stage biotechnology and conventional pharmacology firms to grow while requiring less capital. Another key strategic priority for the industry will be to work collaboratively, from the bottom up, to pressure authorities to improve vigilance related to drug quality and counterfeiting. Significant improvements to policy and practice by the State Food and Drug Administration will be required for a pharmaceuticals cluster to develop the markets—domestic and worldwide—needed to sell its products, and a major marketing effort will need to improve the industry's global image.

Bio-Products
Cluster Candidacy Level: High
Bio-products are a nascent industry on the Corridor, but the core building blocks for the development of this fast-growing industry are excellent on the Corridor—enough that this should be treated as a "seed" cluster on the Corridor and targeted for growth. In order to broaden and deepen its bio-products industry, the Ha-Da-Qi Corridor will have to focus on expanding its ability

[14] 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar.
[15] 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar

to contribute to innovation in leading-edge bio-products. This means continuing and expanding R&D and testing of sources that do not compete with primary agriculture used for human consumption. The Corridor should grow the cellulosic-based ethanol industry in the Province, potentially using new agricultural sources (switch grass, cornstalks, and other sources) from marginal soil, or using corn husks or rice straw as raw material. In addition, the Corridor should identify and develop opportunities to produce petrochemicals or pharmaceutical products from bio-based sources, as noted above. Examples could include the development of bio-based opportunities in the PVC (poly vinyl chloride) market, which would focus on the processing of vinyl chloride monomer to the polymer, including the use of plasticizers based on bio-products, and the increased incorporation of functional fiber and/or cellulose in finished products.

While the Corridor expands its innovation capacities, it should also expand its production capabilities. The Corridor should consider expanding production of ethanol for blending in gasoline. This may result in the production of more ethanol than could be used in Heilongjiang Province which could be exported to neighboring provinces. The Corridor should also continue to expand production of bio-diesel through use of soy and other raw materials (rapeseed, animal fats, and oils). The production could be blended with diesel fuel produced in PetroChina's refineries. This will require coordination with PetroChina on the blending as well as quality issues.
Implementation of large-scale strategies for the bio-products industry—including those listed above and others—requires a bottom-up, industry-driven process. The Ha-Da-Qi Corridor should consider the development of a cluster organization that would serve as the convener of the industry to coordinate the identification and initiation of such large-scale strategic initiatives.

Corridor Economic Foundation Assessment and Options
In order to grow these economy-driving clusters as described and analyzed above, the Ha-Da-Qi Corridor must think of itself as an integrated region and work collaboratively across jurisdictions and company and institution lines, to create specific advantages for these clusters. The Corridor already offers many existing advantages—these must be strengthened and sustained—but new advantages must also be developed. The following section provides an assessment of the Corridor's existing advantages and those it must work to develop in each of the ten main areas (economic input foundations) around which regional competitive advantage can be created. This section also proposes strategic options that should be considered in order to grow competitive advantage in these areas. (Note that full definitions of each of the economic input foundations can be found in Chapter 2 of the full report). Each foundation is labeled with a priority level (Critical, High, or Medium) to help inform prioritization of future initiatives on the Corridor.

Innovation: Create Bridges between Ideas and Marketplace
Priority Level: High
The Ha-Da-Qi Corridor has strong innovation capabilities in the oil and gas and agriculture clusters, but, more broadly, innovation is one of the most underdeveloped economic foundations on the Corridor. The Corridor's "Innovation Pipeline" institutions must work more systematically to extend past basic research to applied research and commercialization, in order to carry innovation from discoveries through to the market and capture the economic benefits (in terms of revenues, jobs, etc.) for the Corridor. This may mean not only providing incentives for innovation by companies and entrepreneurs, but also creating and helping to fund new, market-oriented research, development, and commercialization centers that work with companies in

targeted clusters, whether energy, bio-products or other industry. More research that is unguided by market needs will not improve the Corridor's innovation needs. The Corridor needs to establish formal bridges between research and the end-user needs of the cluster businesses.

Human Resources: Match Skills to Cluster Needs
Priority Level: Critical
The Ha-Da-Qi Corridor has a well-performing "Skills Pipeline" for the oil and gas and agriculture clusters, and to a lesser extent for the metal fabrication and heavy equipment cluster, but the Corridor lacks the Skills Pipeline to support the human resources needs of other existing and emerging clusters. The Corridor must build its own Skills Pipeline so that near and medium-term training is strong for each cluster, successfully feeding the skill needs of the cluster portfolio. This means not simply offering business access to the existing workforce, but improving existing educational institutions and even considering creating entirely new programs, universities, and colleges, which focus on the needs of the Corridor's targeted clusters.

Finance: Build Access to Capital
Priority Level: High
Inadequate availability of risk capital for enterprise growth is frequently cited as an impediment to business development and expansion by young companies in the Ha-Da-Qi Corridor. Although large state enterprises such as PetroChina have adequate access to financing through conventional channels, for most other enterprises—particularly small and medium enterprises (SMEs), availability of financing is a major challenge to growth on the Corridor. To improve access to capital the Corridor must work to build a "Finance Pipeline" that offers companies access to different forms and sources of capital that match each stage of development. This means finding ways to help firms prepare deals, identify early stage investors, aggregate and screen deals, and present them to invited groups of investment funds—sometimes with the Province or a Corridor capital fund to co-invest to share the risk. This also may mean working with multiple commercial lenders on the Corridor to structure enterprise expansion and modernization loans.

Land Use: Adopt "Smart Growth" for Corridor
Priority Level: Medium
There is an abundance of unused, relatively low-cost land along the Ha-Da-Qi Corridor that can serve as a major asset for virtually all industries. However, these low-cost advantages are soon disappearing, and with this availability of land there is a risk that the Corridor will offer too many zones and parks competing against each other for industry attraction, rather than providing sites with distinctive advantages driven by market demand. With its major land assets, the Corridor and its municipalities should work together to guide land use so that economic zones are established carefully and concertedly across the Corridor, and staged so as not to duplicate demand and construction of infrastructure and services. Effective industrial development will: prioritize development of in-fill sites before expanding into green space; coordinate site development approvals with surrounding municipal and regional infrastructure improvements; award development permissions for zones, industrial parks and technology parks on the basis of their distinctive market-based themes; and apply multi-use, cluster-focused development for zone or park planning. Given the duplication of facilities and services offered by existing industrial zones and parks, Corridor authorities should also consider the consolidation of existing economic zones into more efficient zones that share infrastructure and services. Furthermore, the Corridor should

adopt a 'smart growth' approach to spatial development in order to better manage the complex relationships between economic development, environmental sustainability, and social well-being. Region-wide planning efforts should seek to ensure that industrial development occurs in concert with improvements to transportation infrastructure and housing stocks, and that significant emphasis is placed on environmental sustainability and social equity issues.

Governance: Focus on Customer Quality
Priority Level: High

The management practices of municipalities in developed nations emphasize clarity, consistency, and quality of customer service. The quality of municipal governance is a challenge for firms across the Ha-Da-Qi Corridor, from Harbin to Daqing to Qiqihar. The Corridor should work with municipalities to ensure that there are constructive standards used across the Corridor and that common problems that have been identified at the municipal level (e.g., slow permitting process, low confidence in tax structure, low confidence in local courts) are addressed and improved. Moreover, the Corridor should ensure that municipal authorities are streamlining their offerings so that they are not in competition with adjacent municipalities, but in coordination with one another—offering industry and investors the prospect of working in a region that is well-governed and coordinated, and not a fragmented group of municipalities that are out of communication and in competition with each other. Ultimately the Corridor must ensure that there is a high value delivered to each firm for every yuan of tax paid, and that every public agency represented on the Corridor is customer-focused and committed to delivery of a quality product.

Transportation and Logistics: Ensure Market Access
Priority Level: Critical

Transportation and logistics is perhaps the biggest challenge facing the Ha-Da-Qi Corridor. Cost, capacity, and efficiency are all major issues raised in the analysis, and as such, most transit-reliant industries are at a disadvantage on the Corridor. The Corridor should work to provide high-speed, multi-modal logistical access to major markets served by Corridor clusters. Case studies of best practice transportation/logistics centers reveal that it was a strong partnership of public and private stakeholders who jumpstarted the development of key multimodal facilities. In each of these cases, the public-private partnership marketed the concept of a multimodal facility to obtain community support, by identifying and advertising the number of jobs and new revenues that would be added to the region as a result. They also offered business attraction incentives, such as financing for eligible capital projects at favorable rates, capital leases, operating leases, and synthetic leases. Given that each zone around the municipalities on the Corridor has a proposed transportation and logistics center, this provides a strong argument for a Corridor-wide planning effort to ensure consistent planning and coordination of development. The Ha-Da-Qi Corridor should develop similar private sector leadership in coordinating information systems so that transportation and logistics in their fullest form—physical and information—are adequately planned to create Corridor advantages.

Power and Utilities: Leveraging a Key Advantage
Priority Level: Medium

The low-cost and consistent supply of energy (provided by CNPC-owned utilities) is one of the Ha-Da-Qi Corridor's strongest assets for business, especially those that are energy-intensive. However, in order to ensure the long-term sustainability of these advantages, authorities must

begin to address critical long-term challenges by diversifying energy sources, developing more renewable sources of energy, increasing the energy efficiency of major industrial users, and reducing energy-related pollution. The Corridor needs to ensure that access to cost-competitive power remains an advantage over time to compensate for other disadvantages. Each zone of the Corridor should be part of an integrated Corridor power resource network.

Environment: Emphasize Eco-Industrial Solutions
Priority Level: Medium

The Ha-Da-Qi Corridor enjoys a relatively high quality of environment and has even received national recognition for air quality, but the Corridor is still challenged to meet the needs of business and residents for water and waste management—particularly in Harbin. The Ha-Da-Qi Corridor should build upon its existing environmental achievements and improve its situation by addressing its main environmental challenges, namely in water and sanitation; proactively marketing its environmental assets; and exploring innovative models for sustainable development such as with eco-industrial parks. The Corridor should collaboratively plan a Corridor-wide approach to water and waste needs that can be deployed on a distributed basis through shared environmental solutions in each zone and sub-zone of the Corridor. By doing this the Corridor can foster decentralized water and waste solutions that will reduce overall demand and distinguish the Corridor as a leader.

Quality of Life: Retaining Workforce and Corridor Vitality
Priority Level: High

High quality of life motivates workforce movements, and is an end to strive for unto itself. Despite offering such key assets as affordability of housing, abundance of green space, and low cost of living, the Ha-Da-Qi Corridor has had a persistent challenge in offering the quality of life necessary to attract and retain a high-skilled workforce and business investments. Ha-Da-Qi Corridor authorities must collaborate at the Corridor level to develop solutions that provide the quality housing, healthcare, and social amenities needed to attract and retain the young workforce with the "next-generation" skills that are demanded by the Corridor's industries. As a starting point, the Corridor must focus on stemming the loss of graduates from its own universities, with such strategic options as a student retention initiative.

Marketing: Positioning the Corridor Based on Assets
Priority Level: High

Every successful corridor has grown in part thanks to its advantages in human resources, transportation, or any of the other economic foundations, and in part thanks to marketing capabilities that have packaged and advertised those advantages to other regions and worldwide. Marketing remains a major challenge for the Ha-Da-Qi Corridor, as the Corridor is not nationally recognized as a growth center for industries other than energy, and is not known for its economic inputs that growing industries are seeking, beyond abundant land. This creates a substantial pressure for improved marketing in three ways. First, the overall image of the Corridor needs to be improved so that existing industries can more easily attract and retain workforce and suppliers. Second, the image of the Corridor needs to be associated with specific economic input advantages (whether land, energy, skills, innovation, or other) and specific industry clusters (whether bio-products, agriculture, chemicals, or other) in order to attract investors and suppliers. Third, the Corridor needs to have more visible success stories among industries to demonstrate its standing as

a place that meets business needs. To these ends, the Ha-Da-Qi Corridor needs to continue its efforts to identify its cluster portfolio, and it should use this portfolio along with its existing advantages in the economic foundations, as the basis for a clear marketing message about the Corridor. Continuous communication and coordination between key stakeholders is required to ensure that this marketing message is portrayed consistently by provincial and city promotional bureaus, businesses, universities, and other regional players.

Corridor Management Recommendations

ICF has found that improving economic development in a region or corridor depends significantly on coordinating the decisions of many corporations, institutions, municipal agencies, provincial commissions, and national programs. Strong steps have already been taken by the Province and other agencies toward the development of collaborative solutions to ensure the competitiveness of the Corridor.

In order to solidify the collaborative regional relationships that are necessary for the Ha-Da-Qi Corridor to create advantages and compete in today's global economy, the Heilongjiang Province should consider the establishment of a Ha-Da-Qi Corridor Development Authority, which would be unlike traditional planning agencies in that it would have direct knowledge of the competitive needs of each cluster, as defined by the cluster delegates, with critical inputs from economic input institutions and provincial and municipal agencies.

The Ha-Da-Qi Corridor Development Authority would be a Corridor-wide governance structure to coordinate the development and deployment of policies and resources across the Corridor. ICF believes that the best structure to enable the success of this organization would be a formal corridor agency structure that can make its own investments, with deliberately inclusive membership or engagement of industry and Corridor institutions that can manage provincial policies, and perhaps most importantly, coordinate development by provincial agencies and municipalities. This model could also be adopted with less formal structure and power: a multi-jurisdictional association or network could be formed and managed by the Province, without any formal financial or programmatic authority but guiding policy and coordinating decisions by the Province and the corridor's municipalities. Leadership of the Ha-Da-Qi Corridor Development Authority would consist of a management team from the Province and a "Stewardship group" of delegates from each of the clusters and from all key economic input institutions. The Ha-Da-Qi Corridor Development Authority should be engaged in the oversight of cluster-specific initiatives, cross-cluster initiatives, and Corridor-wide branding and marketing initiatives, and the matching of Provincial policies and programs to corridor needs.

This proposed approach—of creating a delegation of representatives from the output side of the economy—each cluster—and from each economic input foundation (including provincial and municipal agencies from all of the metro-regions along the Corridor) goes far beyond traditional focuses on industrial recruiting and packaging of land and tax incentives. A Ha-Da-Qi Corridor Development Authority would be the venue that would formally congregate—on an ongoing basis—the representatives of the economy-driving industries, input foundation institutions, and government agencies, in order to identify shared challenges and develop collaborative solutions that will change the competitiveness of the Ha-Da-Qi Corridor in the global economy.

Conclusions

The five principles of cluster-based regional economic development should be the foundation for all efforts on the Ha-Da-Qi Corridor. The Province has already taken strong steps, but more is needed. The history of high-performing economies worldwide suggests that effective economic development happens when policies, programs, and practices build up from stakeholders of each cluster and all economic input foundations, enabled by agencies from across the Province and metro-regions of the corridor. The way this can be done is through the establishment of a Ha-Da-Qi Corridor Development Authority, which would formally congregate—on an ongoing basis—the representatives of the economy-driving industries, input foundation institutions, and government agencies, in order to identify shared challenges and develop collaborative solutions that will change the competitiveness of the Ha-Da-Qi Corridor. When the Corridor's directions are determined in such a bottom-up delegation of regional stakeholders, Corridor efforts will be directly responsive to the needs of the Corridor's existing and emerging clusters, new and improving economic input advantages will be created, and the Ha-Da-Qi Corridor and Heilongjiang Province will be distinguished from competing provinces and corridors in the global economy.

1. Objective and Overview

The Ha-Da-Qi Corridor is a geographic area in northeast China that encompasses the municipalities of Harbin, Daqing, Qiqihar, Zhaodong, and Anda, that has been designated a targeted zone for economic development by the Heilongjiang Province. The Corridor has been the target of a set of specially-legislated Provincial policies related to land use, finance, innovation, and investment that will be applied along the length of the Corridor in order to accelerate development. The Province has established a small Ha-Da-Qi Corridor Office with a modest staff that is primarily responsible for overseeing the implementation of these policies.

The Governor of Heilongjiang Province now has the opportunity to consider how best to expand the Ha-Da-Qi Corridor's organization and policies in order to accelerate development. With this report, ICF International offers the Ha-Da-Qi Corridor a framework and emerging set of strategic recommendations for corridor growth—rooted in cluster-based collaborative economic development and proven in ICF's experience in over 50 regions worldwide—that, when applied effectively, will accelerate economic development on the Ha-Da-Qi Corridor.

This report will proceed as follows:

- **Chapter 2**: Introduces the ICF framework for economic development on corridors and examines the implication of each component for the Ha-Da-Qi Corridor. This chapter introduces five basic rules that, when applied effectively, will enable the Ha-Da-Qi Corridor to better form, expand, and attract industry in an adaptive, continuously improving manner.
- **Chapter 3**: Presents a preliminary assessment of the current industrial makeup of the Ha-Da-Qi Corridor. The analysis profiles each of the main industries across the Corridor and assesses the opportunities and challenges to building and maintaining these industries. The analysis then offers strategic options for the Corridor that, when applied effectively, will promote the growth of these industries in the future.
- **Chapter 4**: Provides an assessment of the strengths and weaknesses of the ten key economic inputs, or "foundations" that are critical to the competitiveness of the Ha-Da-Qi Corridor, as well as proposed strategic options that should be pursued by Corridor authorities to create the competitive advantages on the Ha-Da-Qi Corridor needed to form, expand, and attract businesses.
- **Chapter 5**: Offers recommendations for a new organizational mechanism, the Ha-Da-Qi Corridor Development Authority, that should be introduced on the Corridor in order to effectively engage the participation of the clusters, economic input institutions, and agencies across the metro-regions along the Corridor. When these partnerships are formalized and convened on an ongoing basis in a new organization, it will be the mechanism for ongoing collaborative solutions that work continually to create advantages on the Corridor and make it a competitive place to live and do business.

We will now proceed with an introduction to the Ha-Da-Qi Corridor and the ICF framework for corridor-based economic development.

2. The ICF Framework for Corridor Development

2.1. Introduction to the Ha-Da-Qi Corridor as a Regional Economy

The Ha-Da-Qi Corridor is an economic zone that has been established to enable and accelerate economic development across Heilongjiang Province and the Northeast. The Corridor is a subset of the Province that geographically encompasses the municipalities of Harbin, Daqing, and Qiqihar, as well as Zhaodong and Anda. The Corridor focuses on achieving development of this corridor with the intention of harnessing the economic assets and capabilities that already exist nearby within and across the municipalities. The corridor zone has been designated as the target for economic growth through a combination of Provincial policies that will be applied along with a wide range of policies, programs, and resources from each adjacent municipality.

The Ha-Da-Qi Corridor can be viewed as a distinctive micro-economic area within Heilongjiang Province. However, the Corridor and its component zones and parks might be more ideally viewed as an environment within which the Province and its municipalities might, together, apply best practices in economic development. After all, most special economic zones are more than simply geographic settings where there are favorable tax advantages that attract industry. Successful economic zones bring together many advantages in economic inputs needed to enable enterprise formation, expansion, and attraction, sustaining and adapting them over time to enable industry adaptation and growth.

For this reason, the Ha-Da-Qi Corridor should be viewed as a means for enhancing economic development practices and resources within all economic areas the Corridor encompasses. In this way, each zone, industrial or technology park on the Corridor, while being an authorized "greenfield" or new development area, will really become areas within which the best practices for regional economic development can be applied. In this way, rather than being truly separate from the economies of their neighboring municipalities, all the Corridor development areas can be economic laboratories or environments for effective micro-economic development. Each component of the Corridor can, ideally, be a setting in which the planning and delivery of the best array of provincial and municipal resources takes place so as to accelerate the formation of new enterprise, the expansion of businesses and attraction of industry into Heilongjiang Province.

The Ha-Da-Qi Corridor is a tool for the Province to use to resolve disadvantages and build new advantages across the Province to strengthen its ability to form, expand, and attract industry on an ongoing basis. The principles that have been developed by the Province are correct; they are summarized as: creating regional economic integrity, taking a new industrialization path that focuses on innovation, using new approaches to development and construction including introducing private capital and foreign capital, turning non-public ownership of the economy into the main force of the Corridor, simplifying administrative approval procedures, taking a scientific and ecological view of land development, encouraging collaboration on construction and development between central government and local government, applying strict management and land use in compliance with the laws, and combining corridor construction with urbanization construction.

Enabling the implementation of the Province's principles requires a new view of how economies grow and improve performance. The following section describes what a corridor is, how different corridors have developed in different scenarios worldwide, and what lessons we have to learn from

them. The history of these and other high-performing regions and corridors worldwide has informed ICF's five principles of regional economic development, which will conclude this chapter.

2.2 Definition of a Corridor and Best Practices Worldwide

To understand the needs facing the Ha-Da-Qi Corridor a first step is to consider what an "industrial corridor" really is and why this concept is used to guide and management development. Across the developed world, the term "industrial corridor" is used to characterize an existing geographic concentration of industry. The term is typically used to describe the natural agglomeration of industrial development due to presence of related advantages in production. For example, the industrial concentration of chemical and related manufacturing along the Rhine River is considered a corridor, as is the Baden-Würtenberg/High Tech Bavaria area in Germany.

Corridors Result from Market-Based Economic Development

In developing countries, just as in developed countries, "corridors" will primarily result from market-based economic development, and less so as a result of intentional policy. This is because in the successful corridors in market economies, a corridor's success is due to its combination of advantages in public *and* private economic inputs. See the example below of lessons learned from Silicon Valley's success.

Case Study: Silicon Valley—An Unplanned Corridor

Industry corridors and technology parks all over the world have taken Silicon Valley in Northern California as their model in many ways. Silicon Valley grew not as a planned economic setting, but rather as a the result of the convergence of positive economic input advantages in that region, which in turn fostered the formation, and later the attraction, of industry.

- **Silicon Valley's success was the result of the convergence of positive economic input advantages**: The distinguishing characteristic of Silicon Valley's success has been the roles played by the economic input institutions (e.g., Stanford University, the university's research park, and nearby venture funds) in attracting and reinforcing the inputs needed to form, grow, and attract industry.
- **The structured integration of finance into business development was essential**: A key distinctive advantage of Silicon Valley has been its access to capital. It started with a few experienced investors in the region who focused on early-stage innovation and located adjacent to Stanford University. The readiness of investors in Silicon Valley to structure financing for riskier ventures gave Silicon Valley an advantage even over regions that had ample capital.
- **Silicon Valley was not a centrally-planned economy, and grew with little oversight at all**: Silicon Valley grew not as a planned economic setting, but rather as a the result of the convergence of positive economic input advantages in the region, which in turn fostered the formation, and later the attraction, of industry. Tax incentives or regulation were never major factors in Silicon Valley's development.
- **The region continues to evolve, adapt, and redress the consequences of poor planning**: Today, almost 60 years after the first "official" Silicon Valley firms started, the region is trying to redress the consequences of poor planning, having to harmonize and streamline permitting and building codes.

Corridors Can Be Assisted by Intentional Policy that Helps Build Market-Based Solutions

Corridors from Silicon Valley to the Rhine Valley developed because of the growth of advantages that attracted or enabled companies to grow, but as the success stories of these natural corridors were studied, governors and municipalities in Europe, the U.S., and Japan began to develop their own framework and policies to accelerate agglomeration of industry development in targeted geographic areas. One such example where these policies were instituted in part was Research Triangle Park (see example below), a much more concertedly-planned corridor than Silicon Valley was. The early practices of RTP and other corridors parallel many of the policies now being applied by Heilongjiang Province in the Ha-Da-Qi Corridor.

Case Study: Research Triangle Park Foundation—
A Corridor Encouraged by the State (Province)

As stated earlier, Silicon Valley was in no way planned by national or state (provincial) governments, yet there were elements of the Silicon Valley development that can be purposefully managed. The following case illustrates how this can take place. It is the story of Research Triangle Park (RTP), a corridor developed over 30 years ago and encouraged (not managed) by the State of North Carolina, to transform a region with a declining industry base.

- **RTP bears striking resemblance to the Ha-Da-Qi Corridor**: RTP is roughly the size of the first phase development planned by the Ha-Da-Qi Corridor—it includes all the land between the three cities of Raleigh, Durham, and Cary, and is bordered by three universities.
- **RTP received limited state support early on but has grown its own capital base over time**: The RTP is run by a private foundation established to acquire the land and serve as the manager its development. RTP has had many partners from the state and local levels.
- **RTP used multiple methods to accelerate development**: Initially RTP worked aggressively to recruit anchor organizations (e.g., IBM) that would attract visibility to the park. As recruitment continued, RTP worked with the universities to develop a flow of graduates into the growing number of high-tech businesses. RTP eventually raised capital to establish the Research Triangle Institute, now one of the U.S.'s leading R&D institutes.
- **The success of RTP has been due to its maintenance of high quality economic input advantages**: RTP has been committed to maintaining, in particular, the quality of its human resources, physical infrastructure, and its transportation/logistics capacity. The access to high-quality economic inputs has been the distinguishing factor of the corridor's success.

Similar to the example of Research Triangle Park, the Ruhr Valley in Germany was a stakeholder-driven corridor effort that eventually received state funding. The key lesson is the same—the Ruhr Valley corridor was successful because, like Research Triangle Park, it created bottom-up, market-based advantages from its existing resources.

Case Study: Ruhr Valley—
A Stakeholder-Driven, State-Sponsored Effort

The Ruhr Valley in Germany was at one time the most important area for coal mining and iron and steel production in Europe. Since its peak in 1970, the region has steadily lost population and jobs. Since 1990, a regional comprehensive planning effort has revitalized the region through large scale brownfield redevelopment and greening of a riparian corridor.

- **The Ruhr Valley suffered from the negative image of a "smokestack" region**. New high tech industries were reluctant to locate in the area because of a perceived lack of cultural and recreational opportunities. Within Germany, these industries located in cities like Frankfurt, Stuttgart, and Munich. While there was some growth in service sectors in the 1980s, it was not enough to offset the loss of mining and manufacturing jobs.
- **The region surrounding Dortmund in the eastern Ruhr Valley has had some success with targeted economic development policies**. The main objectives of the policies were to become a center of technology and service industries and to bolster the quality of the life in the city in order to attract skilled labor. Individual strategy elements aimed to aggressively retain existing enterprises, to foster innovation networks, and to attract new high tech firms. These policies have been successful because they integrated economic and urban development, focused on indigenous economic potential, and were implemented with the collaboration of various stakeholders.
- **A state sponsored 10-year regeneration effort had wider corridor-level impacts**. A special redevelopment company, IBA Emscher Park GmbH, was set up to channel redevelopment funds into a variety of projects focused around the river Emscher, which flows through the corridor. Projects included ecological improvements to the river as well as new housing, business parks, and research centers. Key elements of the effort were the creation of a 300 square kilometer park along the river, high architectural quality in new buildings, and the redevelopment of old industrial facilities. The company worked collaboratively with local governments and citizens to achieve these results.

In conclusion, the most successful corridors—whether planned or unplanned—result primarily from market-based solutions that create new advantages from existing resources in a region. The common theme throughout all successful corridors is market-based collaboration. Planned corridors around the world, such as the Ha-Da-Qi Corridor, can effectively promote economic development by promoting market-based collaboration in their region, as described in the following section. The Ha-Da-Qi Corridor should consider the following five principles for regional economic development. When implemented effectively, these five principles offer a way for market-based collaborative economic development to happen on an ongoing basis on the Ha-Da-Qi Corridor. These principles stem from the history of successful regions and corridors worldwide.

2.3. ICF Principles of Regional Economic Development

The following five principles of economic development illuminate how the most competitive regions worldwide build and sustain competitiveness. These five principles should be the foundation for all strategic directions by the Ha-Da-Qi Corridor in the future. These five concepts are simple, but their impacts are far-reaching: 1) The Corridor must work beyond jurisdictions and think of itself as a region in order to compete in today's global economy; 2) To grow its economy, the Corridor must focus on developing its clusters, the drivers of its economy;

3) In order to develop its clusters, the Corridor must create specific input advantages that grow, expand, and attract business; and 4) The way to create these input advantages is through *collaboration*, where each business, organization, and institution offers a part of the solution and all collectively reap the benefits; 5) The way to formalize this collaboration is to create a corridor organization that convenes delegates of the clusters, foundation input organizations, and government agencies on an ongoing basis in order to engage in continuous creation of new advantages and improved competitiveness.

1. Think Regionally to Compete Globally

The first principle for successful economic development is to focus regionally, rather than jurisdictionally. Geographic regions, not political jurisdictions define where economic development takes place. The reason for this is that the economy is indifferent to administrative boundaries but is concerned with securing economic input advantages. For this reason, throughout history, geographic regions have been the geographic level where economic agglomeration has taken place. What typically defines a region is the contiguity and sharing of common economic inputs. Thinking regionally is essential for competitiveness as it is the geographic unit that is important to industry.

Planning collaboratively at the regional level also enables authorities to better manage the complex relationships between economic development, environmental sustainability, and social well-being. Region-wide planning efforts should seek to ensure that industrial development occurs in concert with improvements to transportation infrastructure and housing stocks, and that significant emphasis is placed on environmental sustainability and social equity issues

2. Focus on Clusters

The second principle for successful economic development is regional focus on cluster development. Analysis of successful regions over time has shown that they have been able to form, expand, and attract groupings of companies and suppliers that are called clusters. Clusters are agglomerations of firms that produce and ship similar products or services to the same or different external domestic or national market segments. They are characterized by their use of similar technologies, skills, types of financing, and logistical infrastructure. These clusters also include suppliers that have followed the producer companies or formed locally and understand their business needs. Further, regions with clusters have public and private institutions that provide inputs in skills, innovation, finance, and infrastructure that create a distinctive economic advantage for these producers and their suppliers. Together, all of these players constitute a cluster.

Clusters are important to any region because as they develop, they become the engines of the economy. Cluster development happens horizontally with the development of a diversity of companies across the value chain which increases economic robustness, and vertically with the development of depth in the value chain which retains more economic value in the region. Clusters create primary employment as well as secondary and tertiary employment in a region. The result is a cluster-based economy that generates higher economic outputs and is better able to adapt to economic cycles, than an economy that has only a handful of large employers and primarily focuses its efforts on attracting specific companies.

A cluster is made of up private *and* state-owned firms, and in each of the Ha-Da-Qi Corridor's clusters there are key state-owned enterprises. The participation of the SOEs in the activities of the cluster, possibly through participation in a future Ha-Da-Qi Corridor Development Authority, which will be discussed in subsequent sections, is valuable to SOEs just as it is to private-sector firms. Participation in a cluster organization creates opportunities for all companies, whether private or state-owned. A cluster organization allows firms to develop linkages that will improve the quality of important inputs and access to key markets, thus improving firm competitiveness *and* overall cluster competitiveness. Collaboration with other cluster members can also enable SOEs to diversify their activities, build partnerships with smaller firms and foreign firms, and, in some occasions, establish joint-ventures and spin-off companies. For instance, the Nan Fang company established a joint venture with a private U.S. company to build subway cars. By adopting a collaborative cluster approach, the Ha-Da-Qi corridor can help existing SOEs to transform, expand, and diversify their activities, helping them to compete in the global marketplace.

3. Develop Economic Input Advantages

The third principle for successful economic development is to focus on creating economic input advantages for each cluster. Clusters only take shape and grow in regions where they derive specific competitive advantages, or economic input advantages. There are ten main categories of economic inputs around which a region can create competitive advantage for its cluster industries. These ten categories of inputs—or "economic foundations" as they are called because they lay the foundations for the regional economy—are described below. A high-performing corridor economy will be able to deliver unique advantages in these inputs to corridor-wide clusters, whether these advantages are delivered by private or non-governmental institutions, or state, provincial, or municipal agencies. Every competitive, high-performing, economic corridor in the global economy must constantly work to analyze and improve the quality of its economic foundations. It is through the creation of distinctive advantages in the economic foundations listed above—tailored to its distinct portfolio of clusters—that a region is able to help form, grow, and retain its clusters.

As is seen below, to be successful, the development of the Ha-Da-Qi Corridor will need to include *not only* investments in factors directly supporting industrial growth such as land, finance, and workforce, but *also* key investments in housing, healthcare, transportation, recreation and entertainment, and environment. These are crucial inputs for the Corridor's economy that must be invested in, improved, and their quality sustained on the Corridor, in order for economic development to be successful.

1. **Innovation**: The ability of the region's institutions to generate new knowledge, transform it into new applications, and deploy new technologies to create new start-up or spin-off companies and ensure the competitive growth of existing industries.
2. **Human Resources**: The capability of the region to prepare the workforce in primary and secondary schools, advance the workforce's skills to meet industry needs, and continually renew workforce skills in response to global industry and economic demands.
3. **Finance**: The ability of a region to meet the full range of business financing needs, from initiation to expansion to restructuring.
4. **Land Use**: The region's ability to manage land to support the formation of enterprise, create communities for agglomeration of cluster activities, and coordinate development to ensure balance among commercial, residential, and industrial uses.

5. **Governance**: The responsiveness of the region to interactions with business, including tax rates, regulatory efficiency, and administrative quality.
6. **Transportation and Logistics**: The region's ability to invest in and/or manage the continuum of logistics needs, from access to distribution channels and services for distribution, to specialized facilities for multimodal distribution transactions.
7. **Power and Utilities**: The availability of a consistent, affordable, and (over time) renewable power supply in the region.
8. **Environment**: The availability and quality of water and waste operations in the region.
9. **Quality of Life**: The ability of the region to meet residents' needs for quality of life, work, and play, including choice, affordability, and quality of housing, healthcare, and culture and recreation options.
10. **Marketing**: The region's ability to take the region's diverse assets and "productize" them for national and global markets, sell and distribute their "product," and promote the region's "product" to companies and investors worldwide.

Regions that are able to improve these inputs relative to the needs of existing and emerging industry clusters will have taken the most important step towards improving regional economic development.

4. Build Advantages through Collaborative Solutions

The fourth principle of the ICF framework is that it is through collaboration that a region can create advantages for its clusters that grow its regional economy. High-performing regions are characterized by a high degree of collaboration of many forms:

- **Business to Business**: Pre-competitive R&D consortia, joint ventures for production and supply-chain finance and marketing alliances.
- **Business to Institution**: Firms working with colleges and universities on curriculum, with laboratories and research institutes on R&D, with utilities, regional logistics centers (ports, airports).
- **Institution to Institution**: Colleges and universities working on training and R&D and partnering in new institutions, commercialization finance, technology parks.

5. A Formal Corridor Organization Enables Growth

All of the principles described above support the establishment of a formal, specially-designed, Ha-Da-Qi Corridor organization, or Ha-Da-Qi Corridor Development Authority, that will serve to bring together the clusters, foundation input institutions, and agencies from across the Corridor on an ongoing basis, in order to create advantages that strengthen the Corridor's competitiveness and improve the ability to market the Corridor externally—thus satisfying the original goals of the Heilongjiang Province in the establishment of the Ha-Da-Qi Corridor.

The Heilongjiang Province should establish a Ha-Da-Qi Corridor Development Authority that works to organize the stakeholders from across the Ha-Da-Qi Corridor, identify their shared challenges, and develop the collaborative solutions that build and improve the array of economic inputs that serve the current and emerging cluster portfolio on the Ha-Da-Qi Corridor and improve the shared advantages of the overall Corridor economy. The corridor development activities need to be carried out at a political level that builds from and integrates development issues shared by the local governments, development zones, and technology parks subsidiary to the corridor itself. Such an organization would have to be comprised of delegates from each cluster and economic input foundation from across the metro-regions.

This entity can be official or an unofficial network that would convene delegates on a regular basis from each of the Corridor's clusters, economic input foundations, and agencies from each metro-region along the Corridor. The Ha-Da-Qi Corridor Development Authority would convene all players on the Corridor—business, universities, transit providers, financial institutions, research institutes, utilities, and all agencies and organizations engaged in the environment, recreation, housing, and healthcare—in order to work collaboratively to identify the most important challenges to living and doing business on the Corridor, and then develop and implement strategic collaborative solutions to these challenges. Such a delegation of stakeholders would be able to avoid the fragmentation of planning efforts among municipalities on the Corridor. ICF proposes that the Ha-Da-Qi Corridor Development Authority be the vehicle for bringing together the Corridor's stakeholders on an ongoing basis in order to make the collaborative decisions that will improve the Corridor's competitiveness in the global economy.

2.4. Key Conclusions on the Five Principles for Regional Economic Development for the Ha-Da-Qi Corridor

The importance of these five principles for the Ha-Da-Qi Corridor cannot be overemphasized—they are simple principles, yet when applied effectively they transform the way of thinking and operating on the Corridor. These principles force all jurisdictions along the Corridor to think of themselves as a region that must work together to create the advantages that will grow and attract business in order to compete in the global economy.

The key conclusions from these five principles for the Ha-Da-Qi Corridor are the following:

- **Aggregate all the Corridor's Economic Forces**: The Corridor is really the sum of its constituent metro-regions, and thinking regionally on the Corridor means that planning and delivering regional economic inputs is an integrated task that requires convening the municipalities, institutions, industry, and all other Corridor players.
- **Identify and Focus on a Portfolio of Clusters**: The identification of industry targets across the Corridor must be based on strategic market demands, not provincial or national politics. Cluster targets can be defined through a cluster strategy process, and the goal should be to agglomerate their value chains.
- **Create Advantages in the Economic Foundations**: To enable formation, expansion, and attraction of industry in each cluster the providers of economic foundations—whether they are national, provincial, municipal, public, or private—must work together to create advantages that align with the needs of the Corridor's target clusters.
- **Collaborate to Create Advantages**: The history of high-performing regions shows that it is through *collaboration* that a region can create advantages for its clusters that grow its regional economy. High-performing regions are characterized by a high degree of collaboration of many forms, from business-to-business, business-to-institution, or institution-to-institution.
- **Create an Organization that Sustains Collaboration**: The Heilongjiang Province should establish a Ha-Da-Qi Corridor Development Authority, which brings together delegates of the clusters, economic input foundations, and government agencies from each metro-region on the Corridor. The Ha-Da-Qi Corridor Development Authority will bring these delegates together on an ongoing basis in order to identify shared challenges and build collaborative solutions that will grow and sustain the presence of the cluster industries and the Corridor's overall competitiveness in the global economy.

These five principles, when applied effectively, offer a way for businesses, institutions, and agencies on the Corridor to work together in order to identify the shared challenges they face on the Corridor, prioritize strategic solutions to these challenges, and implement these solutions collaboratively so that each business and organization contributes a share of the solution—and reaps the rewards. These five principles have a simple elegance, but when implemented effectively, will transform the thinking—and the competitiveness outcomes—on the Ha-Da-Qi Corridor.

With these principles presented, we will now turn our attention to the application of these principles on the Ha-Da-Qi Corridor, starting with a preliminary assessment of the Corridor's industrial portfolio. This industrial portfolio will be the basis for determining the existing and emerging drivers of the Corridor's economy. These driving industries must be the target of specific input advantages that will help them grow and sustain their presence on the Ha-Da-Qi Corridor.

3. Corridor Cluster Portfolio Assessment and Options

ICF has stated that effective growth of the Ha-Da-Qi Corridor can be enhanced by adopting a cluster development perspective in Provincial and sub-provincial policies and programs. For this reason, this chapter presents a preliminary assessment of the current industrial makeup of the Ha-Da-Qi Corridor, intended to inform the Corridor's identification of the industries that drive its economy. Such economy-driving industries should be the target of specifically-defined input advantages that will help them grow and succeed on the Ha-Da-Qi Corridor. The Corridor's input advantage conditions are discussed in the next chapter.

This analysis profiles each of the main industries across the Corridor and assesses the opportunities and challenges to building and maintaining these industries. The analysis then offers strategic options for the Corridor to consider to promote the growth of these industries in the future. The industry assessment is based on information gathered from primary sources, including scores of interviews with stakeholders in industry, government, and other institutions on the Corridor, as well as secondary sources such as Corridor or industry focused studies, articles, and data. The strategic options provided emerge in part from recommendations by stakeholders from across the Corridor and in part through ICF's identification of international best practice initiatives whose lessons could be applied to situations on the Ha-Da-Qi Corridor.
The scope of this assignment did not permit a comprehensive, in-depth, analysis of each of the Corridor's industries. For this reason this assessment should be viewed as an input to future planning of Ha-Da-Qi Corridor directions. Further strategy development should be built up collaboratively, starting from each of the three metropolitan regions up to the Corridor level. The strategic options and case studies presented below are intended only to inform and guide future Corridor initiatives, as they were not completed in a truly collaborative, bottom-up strategy process essential to successful Corridor development.

Each industry reviewed for this analysis is ranked with a cluster candidacy value (High, Medium, or Low) based on its overall strength as a target cluster for strategic growth on the Corridor. This prioritization is based on review of several variables including each industry's existing employment concentration on the Corridor, its industry growth rate, and it's potential for upstream or downstream growth on the Corridor. The information used to generate these rankings derives from input from industry, government, and institutions on the Corridor, as well as from primary interviews and review of existing reports. This prioritization is not conclusive, but rather is meant to inform ongoing discussion of future initiatives on the Corridor.

3.1. Energy (Extraction, Refining, & Services)
Cluster Candidacy Level: High
3.1.1. Cluster Assessment
The energy industry—specifically petroleum extraction—has historically been a major focus of economic activity on the Ha-Da-Qi Corridor. The Heilongjiang Province is currently the lead province in China in the oil extraction industry. With the presence of CNPC in Daqing, the energy industry constitutes over 90 percent of the city's gross industrial output, and petroleum extraction is the primary driver of that statistic (representing 61.9 percent of Daqing's gross industrial

output), while petroleum processing represents 23.8 percent.[16] Activities in Harbin and Qiqihar are primarily related to processing, but on a smaller scale than in Daqing.
The Corridor's assets in the energy industry are vast and largely concentrated in the Daqing region. CNPC's Daqing oilfield has been the #1 oilfield in China for the past 40 years. Well known for its polymer flooding—an enhanced recovery method—CNPC's Daqing oilfield currently accounts for more the one-fourth of China's total crude oil production.[17] Though crude production is in decline (the CNPC Daqing oilfield had previously accounted for 40 percent of China's domestic crude production[18]), oil extraction will continue on the Corridor and new resources may be added to the Corridor's energy cluster.

In addition to oil extraction, several other segments of the energy cluster are emerging on the Corridor, including gas extraction, and petroleum refining. A new and large natural gas field was recently discovered and is being developed and represents a major opportunity for industry growth. In petroleum refining, Daqing refineries are a key asset in the region, and appear to be running at 80 percent of full capacity, and interviews indicate that the development of high value-added consumer goods should be considered for Daqing refineries in the future.

Coal and shale are two products that are produced in other parts of the Province outside of the Ha-Da-Qi Corridor, but there may be new opportunities for the Corridor to process these products. The Corridor may consider the opportunity to convert coal to clean liquids or petrochemical feedstocks, or to turn coal or petroleum coke from refineries into urea and ammonia. Also, the Corridor may want to consider expanding into shale oil production, stemming from the new discovery of resources in Mundanjiang.

The energy cluster—particularly the oil extraction industry—is one of the best-supported clusters on the Corridor by the economic foundations. As a major national enterprise, the oil extraction industry has an extremely well developed set of input foundations in Daqing. Daqing is known to have some of the best technical skills in the industry in China, housed at such institutions as the Daqing Petroleum College and Daqing New & High-Tech Industrial Development Park.[19]

Despite these advantages, the energy cluster still faces many of the same major challenges in the foundation areas that the Corridor's other clusters experience. Transportation and logistics is still a challenge to this and the other clusters on the Corridor. Pipelines exist in the region to move crude oil to regional refineries and to export outside the region, but existing pipeline capacity still falls short of demand. Crude oil that is not moved by pipeline is transported by rail, but rail capacity is insufficient and service suffers from unpredictability, delays, lack of transparency, and in-transit losses—particularly in the winter season. Another major challenge facing the energy cluster relates to the implications of CNPC's control over oil and gas extraction and the first level of refining in Daqing. CNPC's ownership of the Daqing Oil Field and Petroleum Company makes it difficult for other companies to emerge in the market because CNPC

16 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar.
17 Interview, CNPC-Alberta Petroleum Center.
18 Interview, CNPC.
19 Interview, Daqing National Level High-Tech Industry Development Zone, Economic and Technology Development Bureau.

companies have an internal purchasing/supplier network which is only open to CNPC companies, and outside suppliers have to sell through one of CNPC's Daqing subsidiaries.[20]

3.1.2. Strategic Options

The energy sector has the potential for strong economic development across the Corridor. The strategic options below outline proposed initiatives that would develop the linkages upstream and downstream along the value chains of the oil, gas, and refining industries. The final strategic proposal is for the development of a cluster organization that would "convene the marketplace" of the energy cluster on the Corridor and create a venue for the collaborative prioritization and implementation of strategic initiatives on an ongoing basis.

In the oil extraction industry, new conventional oil production from the Daqing region is unlikely. Although Daqing crude production still significantly exceeds local refining capacity, it eventually will decline and jeopardize refinery supply. It is essential to the Province, as well as to the nation, to ensure that access exists to Russian crude via pipeline. Longer term, shale oil may provide some local supply. In addition, it is valuable to consider reversing the pipelines that carry Daqing crude to coastal refineries to allow Daqing to process foreign crude.

In the gas extraction industry, the discovery of a new, large natural gas field in the Daqing region represents major opportunity for growth of this industry. Based on interviews and published reports, a gas pipeline will be built to carry the Daqing gas to the Harbin region and, ultimately, to the Beijing region, but this approach does not deliver significant value to the Daqing region. Other strategic considerations for the future of the natural gas industry must include power generation to displace coal and provide a clean-burning alternative fuel source, residential or commercial applications primarily for space heating, and feedstock for petrochemical production.

In the refining industry, the Corridor's existing unused refinery assets represent underutilized capacity that should be captured in the market. These assets are owned by CNPC and are not directly within Daqing or the Corridor's control, but they are essential to increasing the contributions of the refining industry to the regional economy. Strategic options for the refining industry that should be considered include:

- Continuing investments to modify refinery configuration in order to increase production of petrochemical feedstock and intermediate products;
- Expanding refinery capacity to increase production of fuel products and coincided with the opening of the product pipeline and depot system to supply northeast China; and
- Assessing the competitive performance of Corridor refineries versus leading Chinese and global refineries in order to identify potential investments to improve efficiency, yields, and reliability.

In addition to the above recommendations, the Corridor can also consider utilizing existing infrastructure to expand into the coal and shale oil industries, which currently do not have a presence on the Corridor. Because the Corridor has very strong expertise in processing capability and in the value chain-supporting process of other industries, the region may be a candidate for location of a coal-to-liquid (CTL) facility. The energy industry on the Corridor could consider conducting, possibly jointly with CNPC, technical and economic feasibility studies of how to utilize existing technology to upgrade coal to gas or liquid products.

[20] Interview, Petroleum Research Institute and Heilongjiang Longwei Petro-chemical Company.

In the shale oil industry, which also does not currently have a presence on the Corridor, the Corridor could consider working collaboratively with the provincial institutions and CNPC to develop shale oil production stemming from the new discovery in Mundanjiang. Shale oil represents an opportunity for a new, longer term supply of oil for refineries in the Province, and the Ha-Da-Qi Corridor should consider expansion into this emerging field. Developing this industry will involve a focused effort on determining the optimal extraction process for the shale oil, and an assessment of investment needs for the complete supply chain, including processing in refineries.

The implementation of any of these strategic options will require a new form of collaboration among the marketplace of players in the energy cluster. An energy cluster organization should be established, in order to prioritize the region's challenges and the initiatives that will best address those challenges, and work together to leverage resources toward their implementation. The case study below is a good example for the Ha-Da-Qi Corridor of a cluster organization in Norway that has "convened the marketplace" in order to promote ongoing industry-wide initiatives to remain competitive.

STRATEGIC OPTION: CLUSTER NETWORK TO STRENGTHEN COMPETITIVENESS—
Best Practice Example: The Norwegian Oil & Gas Cluster

The Norwegian oil and gas cluster is made up of both the major international oil companies and a wide array of supply and service companies covering the entire value chain—from exploration via development, production, and operation to decommissioning. In its efforts to promote value creation and competitive production of petroleum resources, the Norwegian Ministry of Petroleum and Energy (MPE) works actively to build collaboration between the authorities, oil companies, research institutions, and universities. Key cluster initiatives it has supported include:

- **Convenes the marketplace**: The purpose of the KonKraft initiative is to convene the cluster's leaders in order to identify and address issues of strategic importance to the entire petroleum sector. This forum convenes 30 leaders from oil companies and service companies, trade unions, research institutions and Government bodies, including the MPE, the Ministry of Finance, and the Ministry of the Environment.
- **Leads collaborative cluster strategy**: In 2001, the MPE established a task force to help the petroleum industry formulate a coordinated national technology strategy for the oil and gas industry. This collaborative strategy, entitled OG21, articulated the industry's consensus around the most important and urgent priorities for research and technology development that would improve its international competitiveness.
- **Assists marketing**: Intsok is a strategic initiative to promote the internationalization of the Norwegian oil and gas industry. Intsok monitors global market conditions, helps select target countries, coordinates marketing activities (e.g., vendor meetings with oil companies and contractors), and provides targeted assistance to SMEs to access international markets.

3.2. Metal Fabrication & Heavy Equipment
Cluster Candidacy Level: High
3.2.1. Cluster Assessment

Metal fabrication and heavy equipment have a major presence in the Ha-Da-Qi Corridor, particularly in Qiqihar and Harbin. In each of these municipalities, this industry represents the dominant share of gross industrial outputs (45 percent in Qiqihar and 39 percent in Harbin). This represents a major concentration of the cluster on the Corridor, with most of this concentration in

downstream activities—namely, transportation and other equipment manufacturing, and a lower concentration of activities in upstream activities (smelting and other metal processes). The exception to this is in Qiqihar, where there is a significant smelting segment (representing nine percent of the city's gross industrial product).[21] The major energy sector activities in the Ha-Da-Qi Corridor region require an ongoing supply of primary support equipment, including compressors, pumps, piping, control valves, instrumentation (electronic, pneumatic, and optical). The metal fabrication and heavy equipment industry is valuable to several of the other Ha-Da-Qi Corridor clusters and to national markets.

Although the metal fabrication and heavy equipment industry is very strong on the Corridor, and its potential very large, some interviews conducted in the course of this strategy process indicated that the region's production is not as competitive as the equipment manufactured overseas by international companies. Qiqihar, for instance, has the largest domestic heavy equipment manufacturer, but it is not competitive against international companies such as GE, ABB, and Siemens.[22] Innovation is also a challenge for this cluster, with foreign companies controlling most of the high-tech aspects of this industry.[23] While heavy equipment manufacturing is one of Heilongjiang's six provincial priority industries, the Province holds very few patents in the field.

3.2.2. Strategic Options

The metal fabrication and heavy equipment industry is a very important supplier to the Corridor's other industries, and one which holds the opportunity for a strong cross-industry network of advantage for the Ha-Da-Qi Corridor region. The growth of the metals and machinery industry is essential to the competitiveness of the region's economic portfolio. As such, several existing plans for the region, such as the NDRC NE China Revitalization Plan, have already prioritized this industry for growth. It has a number of synergies with the Corridor's other clusters, including energy, chemicals, agriculture (both production and food processing), bio-products, and pharmaceuticals. Actions should be taken to accentuate these synergies along the Corridor in order to strengthen the competitiveness of this industry, particularly against international competition.

One potential area for growth of this industry could be in machinery and equipment to improve energy efficiency for businesses and consumers (e.g. efficient furnaces, water heaters, distributed generation equipment, etc.). The development of an effective energy efficiency initiative in this region would provide a number of regional and national benefits. First, energy usage would decline, favorably impacting national and regional balance of payments. Second, industries which support energy efficiency markets, including insulation, boiler, and furnace control systems, lighting companies, compressor manufacturer's, among other products, would find a local market, and a good base for expansion within and outside the region. Consumers would realize additional spending capacity, which would stimulate demand for other consumer goods and grow the economy.

The competitiveness of the metal fabrication and heavy equipment industry cluster industry will require aggressive modernization of equipment, capital, and skills, and constant assurance of

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21 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar.

22 Interview, Department of Science and Technology of Heilongjiang.

23 Interview, Department of Science and Technology of Heilongjiang.

both product quality and a match to end-user needs. Interviews have indicated there may be competitive disadvantages in quality of equipment versus more global companies who could be supplying CNPC and other manufacturers.

3.3. Agriculture (Primary & Value-Added)
Cluster Candidacy Level: High
3.3.1. Cluster Assessment

Agriculture is a primary focus of the Heilongjiang Province, and this industry spans many segments, from growing to production to processing to packaging, to agri-tourism and even the production of new technologies from waste products. Some of the Ha-Da-Qi Corridor's main agricultural products include corn, wheat, rice, potatoes, beans, grains, berries, and herbs. Cattle, pigs, sheep, and other livestock are also raised for their meat and dairy products.[24] The industry's traditional focus has been on the growth of crops for the needs of the people, as direct food supply and for processed foods. Agriculture has a particularly strong presence in the Harbin and Qiqihar regions (28.0 and 25.6 percent of each metro-region's respective gross industrial outputs). The upstream activities (agricultural products processing) are the biggest portion of the agriculture industry on the Corridor. Food and beverage production make up a smaller portion of the industry, and the tobacco industry has a small presence in Harbin.

The agriculture industry on the Corridor has a range of assets that position it to enter into the green and organic food industry. Its black soil has more nutrients and thus requires less fertilizer.[25] Qiqihar leads the Corridor in "green foods" as evidenced by its concentration of green food product companies and its hosting major industry events in the past several years. Daqing has an expressed interest in expanding its green food industry, including grain, oil products, vegetables, soy beans, and potatoes, and an organic green production base of carrots, dry chili pepper, mushrooms, melons, and flowers.[26] Harbin is a sales hub for green food, with an integral distribution and sales network covering over 400 outlets in the Province, selling 104 different certified organic products. Companies like Heilongjiang Tianyuan Food Co., Ltd Daqing Kanggang Food Co., Ltd and Tieli City Taoshan Tiande Ginseng Development Co., Ltd., are the main exporters of organic soybean, ginseng and other green products.

There is also an opportunity for growing corn for bio-fuels: The National Grain Company is sponsoring ethanol plants around the country and currently working on genetically altering corn for stalk-based cellulosic ethanol production, and also considering opportunities with grasses, potatoes, yams/sweet potatoes. The Ha-Da-Qi Corridor must consider what opportunities exist in this field, considering corn is one of its main crops.

Soy value-added applications, such as in paints, dyes, inks, plastic precursors, and plastics are an important target for growth on the Corridor. Given the facts that China imports 30 million tons of soy, firms on the Corridor will likely find a market for value-added soy applications, beyond their current work in soy based-proteins and bio-diesel. Industry-university collaboration has begun in this area, with the largest soybean company in Daqing currently developing a training program with the August First University.

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[24] 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar.
[25] Interview, Department of Science and Technology of Heilongjiang.
[26] Daqing Assessment of Local Industry Structure.

The successful development of the food service segment of the agriculture cluster will require (1) increasing access to R&D in targeted markets; (2) improving enterprise financing and logistical services to help firms enter new markets so that investors can see the region as a fertile investment opportunity; and (3) enhancing the region's capacity to develop products that are market-driven. This market orientation will require developing the capacity to identify markets in which the Corridor's cluster has comparative or competitive advantages, assess changes in consumer preferences, and modify products to meet these changes in consumer preferences and demand.

3.3.2. Strategic Options

Primary agriculture is a major strength of the Corridor economy. Agriculture is fundamental to a number of other industries in the area—particularly emerging areas such as bio-fuels. The major diversification opportunity that exists is to examine primary agriculture (focusing on corn and wheat) for ways to grow consumer goods and at the same time maximize the value of what is produced from the existing soil. To do this, the major issue to address is how to make the primary agricultural sector stronger and more diversified. Strategic options include:

- **Expansion of agricultural genetics to enhance crop yields.** R&D should continue to be done to increase crop yield per acre under environmentally balanced conditions. For instance, certain soils may not be appropriate for food but would be adequate as raw materials for bio-fuel production (e.g., switch grass production for ethanol).
- **Improve human resources for bio-fuels and bio-products.** The Corridor should expand research into the development of commodity crop processing for bio-fuel and bio-product production separately from food. Attempt to expand the season (through crop genetics) and well as bio-processing technologies.

Given the marketing challenge that imported Western food is viewed as having better quality, the Corridor could consider collaborating with Western companies to develop a factory and/or food processing plant to develop products that are similar to what is produced in the West. This would enable China to develop industries that bring food processing and packaging to the market consistent with Western standards.

3.4. Chemicals (Commodity & Specialty)

Cluster Candidacy Level: Medium

3.4.1. Cluster Assessment

The chemicals industry is a comparably-sized portion of each of the industry portfolios of Daqing, Harbin, and Qiqihar (ranging from 2.8 to 3.6 percent of each city's gross industrial output).[27] Though small, the chemicals industry (consisting of both commodity and specialty chemicals) is an important presence on the Corridor. Current activity is predominately in upstream activities (e.g., raw chemical materials and chemical products) and less in downstream activities (e.g., rubber and plastics), though interviews conducted by ICF reveal that there are a growing number of businesses on the Corridor in the production of derivative and consumer goods.

The major challenge for the chemicals cluster on the Ha-Da-Qi Corridor is to capture and retain the high-demand, value-added activities for petrochemical derivatives and consumer goods, rather than exporting petrochemicals as commodities to other parts of China. Such diversification

[27] 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar.

and growth in the derivative chemicals and consumer goods markets will require new collaboration between the upstream sourcing and the downstream consumer requirements. However, growth of this industry along the Corridor will be difficult without investment from PetroChina. The Corridor must demonstrate an ability to add higher value locally, either through highlighting local demand or developing methods to produce consumer goods in the region more cost effectively than in other provinces.

3.4.2. Strategic Options

There is significant potential for growth of commodity and intermediate production in the Ha-Da-Qi Corridor. The Corridor must consider ways to utilize existing incremental production capacities for its intermediate products in order to produce value-added products in the consumer goods market. Options include: refinery projects; the conversion of coal to liquid or gas to liquid projects that result in added petrochemical supply; and the development of petrochemical supply from bio-based industries (e.g., converting bio-sourced materials into industrial applications, such as paint, etc.).

The next step that the Corridor's chemicals cluster should consider is a more in-depth assessment of the market, competition, and its own capacity in order to identify the best areas for deepening or broadening the supply chains in the region in order to realize the highest possible growth of value-added products in the region. The Corridor must evaluate the market in order to identify the optimal end products for meeting consumer and business needs in the region (e.g., products for building insulation, tires for transportation needs, etc). The Corridor must also consider its refinery capability to produce additional petrochemical feedstocks, either through upgrades or other modifications to refinery operations. Finally, the Corridor must evaluate the overall growth of petrochemical derivative products in the Ha-Da-Qi Corridor and China overall. A number of petrochemical projects are underway in China and the Middle East (with China as a target market for derivative products). It will be important to expand the petrochemicals industry along the Ha-Da-Qi Corridor in order to compete with those initiatives.

3.5. Pharmaceuticals

Cluster Candidacy Level: Medium

3.5.1. Cluster Assessment

The pharmaceuticals industry in the Ha-Da-Qi Corridor exists primarily in Harbin, where there are 45 companies and 26,866 people employed, and the industry makes up 7.9 percent of the city's gross industrial output. The industry has little to no presence in Daqing and Qiqihar.[28] The Harbin Pharmaceutical Group has played a pivotal role in establishing a base in Harbin for antibiotics production, chemical raw materials, and medicine intermediates. The industry has the support of the Province, as one of Heilongjiang's six provincial priority industries.[29] The industry also shows strong indications of innovation activity, evident in R&D funding of 1,655,900,000 yuan to the industry in Harbin. The sources for finance for the pharmaceuticals industry in Harbin range from venture capital and financial institutions to the provincial government and other sources. Tech parks in Harbin have been established for the industry, including the Harbin Limin Medicine Technology Park and the Harbin Medicine Industry Park.[30]

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28 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar.

29 Interview, Department of Science and Technology of Heilongjiang.

30 BizChina, "Petrochemical, pharmaceutical industries thrive in Heilongjiang," November 6, 2006. http://www.chinadaily.com.cn/bizchina/2006-11/06/content_756638.htm.

The main challenge facing the Harbin pharmaceutical industry's competitiveness is the level of value the Harbin cluster brings to the industry—the Harbin cluster produces low-value products.[31] The industry revolves around antibiotics, water injections, and powder injections of traditional Chinese medicine, and medicinal starch and healthcare products.

Another key challenge facing the pharmaceutical industry is maintaining quality standards. In a recent case, the production of a cheaper, counterfeit glycerin—one that was poisonous and left many dead worldwide—was traced to a company in Qiqihar.[32] National authorities have done little to investigate. This problem is not specific to the Corridor, but rather it is nationwide, and it will need to be the subject major, nationwide reforms if a successful pharmaceuticals industry can develop in the Ha-Da-Qi Corridor and elsewhere in China.

3.5.2. Strategic Options

The key priority for the pharmaceuticals industry is to grow its value-added segments. Possible linkages between the pharmaceuticals and bio-products industry should be strengthened for the competitiveness of both industries. The case study below is a good example of how a pharmaceuticals cluster in the United Arab Emirates organized itself to deepen its value chain and improve its competitiveness in the global market.

[31] Interview, Ha-Da-Qi Corridor Office.

[32] The New York Times, "From China to Panama, a Trail of Poisoned Medicine," 5/6/2007, http://www.nytimes.com/2007/05/06/world/americas/06poison.html?ex=1180238400&en=91237b562c742bad&ei=5070.

CASE STUDY: PHARMACEUTICALS CLUSTER COMPETITIVENESS STRATEGY—
Best Practice Example: United Arab Emirates

The United Arab Emirates (UAE) has a small pharmaceutical industry, primarily consisting of one large producer of formulations, a pharmaceutical packaging company, and many conventional and ethno-botanic drug distributors. Given the nation's desire to create more high value-added jobs, the government prioritized pharmaceuticals as a key cluster and a public-private partnership initiative was launched.

An analysis of the cluster showed that there was a mid to low value-added capacity, with little drug development capacity but strong expertise in production management and packaging. The analysis identified the UAE's advantages in terms of important inputs, including low-cost energy, chemical feedstocks such as Benzene, and strong interest of development sites (such as the industrial park and freeport of Jubal Ali) to house future pharmaceutical development, and led to the development of a three-part cluster strategy.

First, key segments of the pharmaceutical marketplace were targeted for development in a way that was synergistic with current production. To further attract producers with strong R&D capability, a contract manufacturer was targeted as an anchor focus. Second, to deepen the value chain of cluster producers and suppliers, a business plan was prepared for the creation of a new pharmaceutical and drug development corporation, to be capitalized with public funding. This corporation would house applied research and development programs, as well as an incubator for new pharmaceutical start-ups. Third, a "pharma-park" was planned to agglomerate the development corporation, contract manufacturing, new start-ups, and incoming producers and suppliers in one physical site to share key infrastructure and increase efficiencies.

Planning, coordination and investment of this kind can assist pharmaceutical industry development.

The Corridor's pharmaceuticals industry should also work collaboratively, from the bottom up, to pressure authorities to improve vigilance related to drug quality and counterfeiting. Significant improvements to policy and practice by the State FDA will be required for a pharmaceuticals cluster to develop the markets—domestic and worldwide—needed to sell its products, and a major marketing effort will need to follow in order to make up ground for the damage done to the industry's image.

3.6. Bio-Products

Cluster Candidacy Level: High

3.6.1. Cluster Assessment

The Ha-Da-Qi Corridor's assets in the bio-products industry are just taking shape. Bio-products are a nascent industry, so industrial output and employment in the industry are not yet evident; however the core building blocks for the development of this industry are excellent on the Corridor. The primary assets include a diverse agricultural and forest commodity base and strong human resources in energy and chemical processing. ICF believes that the high growth of this industry, combined with the strong existing assets and synergies with the Corridor's other clusters, warrants treating the Corridor's bio-products industry as a "seed," or early-stage, cluster that should be targeted for growth.

The Corridor has existing strengths in the building blocks of this nascent, high-growth industry. The Heilongjiang Province is well-involved in the agricultural applications for bio-fuels, highlighted by the fact that the largest ethanol plant in the world is located at Jilin near

Heilongjiang. Ethanol production is expected to rise dramatically in response to rising demand—China's ethanol production is targeted to grow from 1 million tons in 2005 to 15 million tons in 2020. Heilongjiang, with the largest forestry industry in China, has major capacity for its forestry products (e.g., cellulose) to serve as feedstock for bio-products from fuels to composite construction materials. In Daqing, the China Alcohol Resources Company is already producing ethanol from corn—a major achievement, even if in the pilot stage. The Corridor also has a project underway with an international partnering soy processor to produce bio-diesel from soy oil.

Several challenges exist to getting this nascent industry off the ground. Applied R&D capabilities focused on leading edge bio-products are not yet developed on the Corridor, but the potential for their development is large. There are also distinct challenges for the segments of this potential cluster. For example, in the case of bio-fuels, challenges exist related to developing cost-effective technologies for cellulose-based ethanol distillation and bio-chemical processing, and for developing the distribution system for ethanol and ethanol blends outside the Province.
Most of the challenges facing this industry are related to the experiences of a nascent industry, and the Corridor's strong seeds for a bio-products industry make it a strong candidate for cluster development. As it has elsewhere in the world, this industry will need strong support to be grown. But the payoffs for the region could be large.

3.6.2. Strategic Options

The development of the Corridor's bio-products industry should build on the region's existing assets. The industry's growth could be integrated, to some degree, with the oil industry in Heilongjiang itself, which requires PetroChina and national government cooperation in the areas of bio-fuels (ethanol and bio-diesel). Opportunities for bio-based products may more easily have synergies with the downstream petrochemical sector.

In order to broaden and deepen its bio-products industry, the Ha-Da-Qi Corridor will have to focus on expanding its innovation capacity for leading-edge bio-products. This means continuing and expanding R&D and testing of sources that do not compete with primary agriculture used for human consumption. The Corridor should grow the cellulosic-based ethanol industry in the Province, potentially using new agricultural sources (switch grass, cornstalks, and other sources) from marginal soil, or using corn husks or rice straw as raw material.

In addition, the Corridor should identify and develop opportunities to produce petrochemicals or pharmaceutical products from bio-based sources. Examples could include the development of bio-based opportunities in the PVC (poly vinyl chloride) market, which would focus on the processing of vinyl chloride monomer to the polymer, including the use of plasticizers based on bio-products, and the increased incorporation of functional fiber and/or cellulose in finished products.
While the Corridor expands its innovation capacities, it should also expand its production capabilities. The Corridor should consider expanding production of ethanol for blending in gasoline. This may result in the production of more ethanol than could be used in Heilongjiang Province which could be exported to neighboring provinces

The Corridor should also continue to expand production of bio-diesel through use of soy and other raw materials (rapeseed, animal fats, and oils). The production could be blended with

diesel fuel produced in PetroChina's refineries. This will require coordination with PetroChina on the blending as well as quality issues.

Implementation of large-scale strategies for the bio-products industry—including those listed above and others—requires a bottom-up, industry-driven process. The Corridor needs to convene the range of stakeholders in the bio-products industry, from industry to research parks to government to universities, in order to identify and prioritize strategic initiatives and manage implementation. The Ha-Da-Qi Corridor should consider the example of the province of Saskatchewan (below), which funded the development of a cluster organization that would serve as the convener of the industry to coordinate the identification and initiation of such large-scale strategic directions as those listed above.

STRATEGIC OPTION: BIO-PRODUCTS CLUSTER ORGANIZATION—
Best Practice Example: Ag-West Bio, in Saskatchewan, Canada

The province of Saskatchewan is one of Canada's principal agricultural regions. In the 1980s, the province's leaders realized that the bio-products field could be a key emerging driver of the economy. In 1988, with funds from the provincial department of Agriculture and Food, an organization called Ag-West Bio was created to provide region-wide leadership of the development of this emerging cluster. This cluster organization now has over 90 organizational members, drawn from a wide range of corporations, associations, universities, and research centers. Ag-West Bio helps build Saskatchewan's bio-products cluster in the following ways:

- **Provides the industry perspective to government**: Ag-West Bio is the venue where industry can communicate to government in order to develop transparent and efficient regulatory policies that enable the growth of the bio-products industry.
- **Provides direct early-stage investments:** Ag-West Bio offers direct early-stage investments through its Commercialization Fund, and also provides assistance in locating matching grants and investments, to help promising technologies at the early stages of development where the risks are too great for most private capital sources.
- **Acts as representative of the cluster**: By communicating sector issues, trends and opportunities to stakeholders, government, and the general public, Ag-West Bio develops public awareness, understanding, and support for the growth of the sector and enhances the image of the region.

3.7. Conclusions

As seen from this assessment, across the Ha-Da-Qi Corridor industrial base there are a number of opportunities for cluster competitiveness, building from the region's existing and emerging industries.

This preliminary assessment has concluded that there are a number of candidates to be targeted for growth on the Corridor. The highest candidate clusters—those that should be targeted by the Corridor's efforts with the highest immediacy and priority—are:

High Cluster Candidacy Level

- Energy
- Metal Fabrication & Heavy Equipment
- Agriculture (Primary & Value-Added)
- Bio-Products.

In each of these industries, the national market is growing and the potential for upstream/downstream growth on the Corridor is significant. Still, the growth of these industries (particularly those for which concentrations on the Corridor are still not well-developed) requires the Corridor to overcome significant challenges in key economic input foundations that are affecting the competitiveness of these clusters. These challenges will be discussed in the chapter to follow.

The other industries extant on the Corridor exhibit assets of their own, but they are not as highly prioritized for cluster growth for a variety of reasons. They may have high market growth, but their economic potential is not high because their concentration on the Corridor is limited by key weaknesses in the Corridor's economic input foundations. Alternatively, they may have a high concentration on the Corridor, but their market forecast is not strong. The medium candidate clusters are:

Medium Cluster Candidacy Level

- Chemicals (Commodity & Specialty)
- Pharmaceuticals.

These medium-priority industries are still engines of the Corridor economy, and they should be served by the region as part of the "cluster portfolio approach" to managing the region's economy, but their growth may not be as highly prioritized as those of the high-priority clusters listed above. All clusters on the Ha-Da-Qi Corridor, whatever their concentration or strength or stage of lifecycle, should be represented in a Ha-Da-Qi Corridor Development Authority, which can serve as the convener of the Corridor's marketplace.

In order to grow these economy-driving clusters, the Ha-Da-Qi Corridor must think of itself as a region and work together across jurisdictions to create specific advantages for these clusters. The Corridor already offers many existing advantages—these must be strengthened and sustained—but new advantages must also be developed. The following chapter provides an assessment of the Corridor's primary existing advantages and those it must work to develop in order to grow its cluster portfolio. The organizational mechanism for developing these advantages by "convening the marketplace" across the Corridor (cluster businesses, foundation institutions, and government agencies at all levels) will be the Ha-Da-Qi Corridor Development Authority—the development of this organization will be described in Chapter 5.

4. Economic Foundation Assessment and Options

As described in the framework chapter, industry clusters will only grow in a market or mixed-market economy when they are able to obtain advantages in specific economic inputs they need. While each cluster can have very different input needs—whether for skills innovation, logistics or finance—a competitive economy has diverse economic input providers---agencies and institutions—that are able to deliver the inputs that most clusters need, and are able to change to meet market needs. This chapter of the report provides an assessment of the strengths and weaknesses of the ten key economic inputs, or "foundations" that are critical to the competitiveness of the Ha-Da-Qi Corridor, as well as proposed strategic options that can be pursued by Corridor authorities to create the competitive advantages needed to form, expand, and attract businesses. These strategic options were developed through primary interviews with key stakeholders and through examination of international best practice initiatives whose lessons could be applied to the Ha-Da-Qi Corridor. Each foundation is labeled with a priority level (Critical, High, or Medium) to help inform prioritization of future initiatives on the Corridor.

4.1. Innovation
Priority Level: High
4.1.1. Foundation Assessment

The Ha-Da-Qi Corridor has strong innovation capabilities in the oil and gas and agriculture clusters but, more broadly, innovation is one of the most challenged economic foundations on the Corridor. The Corridor's innovation capacity, which encompasses 125 research centers and 65 institutes of higher education, must evolve to serve market needs beyond oil and gas and agriculture Moreover, the Corridor must work to extend its capabilities past basic research by strengthening applied research and commercialization functions, in order to carry innovation through to market.

Daqing has the highest presence of innovation on the Corridor, with far greater revenues and numbers of people employed in science and technology than Harbin or Qiqihar. Most of this activity consists of research and technical testing in petroleum, and a large part is conducted by PetroChina Daqing subsidiary companies.[33] The Municipality of Daqing has strongly encouraged linkages between the city's 100 research centers and seven universities. Joint R&D investments by the City, Daqing PetroChina companies, and Daqing Petroleum College have resulted in several new petroleum-related R&D centers.[34] The results in Daqing in petroleum innovation are impressive; since 2000, the petroleum and petro-chemical industry in Daqing has achieved 21 provincial-level R&D results and has developed 135 new technologies.[35]

Harbin has an innovation presence, albeit smaller than Daqing's, primarily focused on agriculture, bolstered by the presence of nine state-level technological centers, 19 provincial-level technological centers, 21 key laboratories of nationally-advanced standards, and strong

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[33] Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group; Interview, CNPC.

[34] Interview, Petroleum Research Institute and Heilongjiang Longwei Petro-Chemical Company; Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group.

[35] Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group.

universities including Harbin Institute of Technology, Harbin Institute of Engineering, Heilongjiang Institute of Science and Technology, and Northeast Agricultural University. Harbin is home to the National Soy Engineering Center at Northeast Agricultural University, which positions the city for opportunity in the growing field of soy value-added products.

Despite these assets, the Corridor does not have a large innovation capacity in other high-growth industries besides oil and gas and agriculture. There are seeds of potential for soy innovation in Harbin, yet Harbin's National Soy Engineering Center still focuses primarily on value-added food, and not yet chemical feedstocks and value-added chemicals. There is strong potential for Qiqihar—already a strong presence in the high-growth industry of heavy equipment—to expand its value chain into innovation in the industry, yet the city has a very small innovation presence, produces few patents in this field, and foreign companies control the higher value-added innovations in this industry.[36]

Moreover, the Corridor lacks a strong culture of entrepreneurship that encourages individuals to deploy new innovations in the local economy, start up new companies, and diversify the region's existing industry portfolio. Most R&D, even in oil and gas, is focused on applied research, and less on commercialization, and few new innovation-driven enterprises, value-added businesses, exports, or private and joint-venture enterprises are created. Research on the Corridor—often dominated by PetroChina—can often be reactive, as Daqing's PetroChina subsidiaries do not have any autonomy in their R&D directions: they receive orders from the Daqing Petroleum Management Bureau, the arm of Daqing CNPC that supports the Daqing Oil Field Company.

There is potential to enhance the Corridor's innovation pipeline through the Province's new incentives for technology companies, individual entrepreneurs, and staff of R&D institutes, and the growing support of the National Ministry of Science and Technology for the Ha-Da-Qi Corridor. However, the institutional culture of the Corridor's R&D institutions and companies may have to evolve further to serve emerging new markets (such as value-added agriculture and heavy equipment) and effectively carry innovation through to market.

4.1.2. Strategic Options

In a successful regional economy, innovation takes place by institutions that are interconnected in an "Innovation Pipeline" of capabilities to discover, develop, and deploy knowledge into the marketplace. Leading industrial corridors work hard to create and maintain large, dedicated, public, and private institutions that carry out research, development, and commercialization that is eventually captured in the corridor's existing and emerging clusters, in terms of new products, jobs, and revenues. Developing and maintaining an "Innovation Pipeline" in which activity is taking place at each stage of innovation (discovery, development, and deployment) and flowing smoothly into the next, and commercialization results are being captured by the corridor's cluster industries, is the key to creating a successful innovation foundation.

The Ha-Da-Qi Corridor's Innovation Pipeline is currently stunted—the region has little activity on the deployment end of the pipeline. The Corridor's Innovation Pipeline institutions must work to extend past basic research to applied research and commercialization, in order to carry innovation through to market and capture the economic benefits of innovation (in terms of

[36] Interview, Department of Science and Technology of Heilongjiang.

revenues, jobs, etc.) for the Corridor. This may mean not just providing incentives for innovation, but creating and helping to fund new, market-oriented research, development, and commercialization centers in the targeted clusters.

The case study below is an example of a concrete strategic initiative that bolstered one region's innovation capabilities in the emerging agricultural biotech industry.

STRATEGIC OPTION: BUILDING THE INNOVATION PIPELINE—
Best Practice Example: Innovation Pipeline in Saskatoon, Canada

The city of Saskatoon, Canada is a recognized as a leading center in agricultural biotech. Over the years, it has built a world class innovation pipeline by forging links between organizations working at each of the three stages of innovation—discovery, development, and deployment. Within a single region, the following resources have been mobilized to foster synergies among industry and university and stimulate higher value-added innovation in the agricultural biotech industry.

- **Discovery**: Primary research is conducted by a range of institutions, including the National Research Council's Plant Biotechnology Institute (which focuses on crop research, cell technologies, molecular and development genetics, and protein research); the Saskatchewan Research Council (which operates and oversees the Fermentation Pilot Program); and the University of Saskatchewan (which conducts research on bio-fuels and bio-products).
- **Development**: Applied R&D is carried out by institutions such as the POS Pilot Plant (which specializes in extraction, purification, and modification of bio-based materials) and the Prairie Agriculture Machinery Institute (which designs, develops, and fabricates related machinery and components).
- **Deployment:** Finally, a world-class, provincially-funded research park called Innovation Place was established with provincial funds to attract new and existing companies active in the development of bio-products to locate near these research institutions. Over 100 companies have located in the park to utilize office space, on-site wet labs, office amenities and conference space, and greenhouses and growth centers.[37]

The linking together of these related parts of the Innovation Pipeline has helped these research organizations to keep the cost of innovation low, helped their clients take their ideas to commercialization, and helped the region to become a leader in the development of new value-added agricultural products.

4.2. Human Resources
Priority Level: Critical
4.2.1. Foundation Assessment

The Ha-Da-Qi Corridor has historically offered one of the best-skilled workforces in China for the oil and gas industry, and it also offers a relatively cheap low-to-mid-skilled workforce for the agriculture and heavy equipment industries, but it lacks the high-skilled workforce of other Chinese cities to support other clusters. As such, human resources is one of the biggest challenges facing the Ha-Da-Qi Corridor; the challenge of meeting the Corridor's workforce needs is probably only second in importance to the challenge of meeting the Corridor's transportation and logistics needs.

[37] Innovation Place website, http://www.innovationplace.com/html/frameset.html.

The Ha-Da-Qi Corridor is, in fact, rich in educational institutions; with 65 institutions of higher learning and 40 universities, the Corridor has by far the strongest talent in the Heilongjiang Province. Harbin, in particular, is rich in educational options, with 35 institutions of higher education and an estimated 38 percent of workers with a university education—highest by far on the Corridor.[38] The Corridor has a historically talented workforce in oil and gas—Daqing is home to some of the best technical skills in China in the petroleum, petro-chemical, and agriculture industries.[39]

Despite the benefits the Corridor offers to the oil and gas industry and to industries that need a low-to-mid-skilled workforce, the growth, attraction, and retention of a young, high-skilled workforce to feed the Corridor's other clusters is the root of the Corridor's human resources challenge. Because most of the Corridor's universities focus on petroleum, petrochemicals, or agriculture, the Corridor's other industries are forced to seek partnerships with universities outside the Corridor to develop their human resources. The Corridor's universities also suffer a lack of professional management programs; as a result, companies on the Corridor are constantly forced to recruit from outside the Province for employees with skills in business management, information technology, marketing, law, and communications.

Quality of life and lower wages in some industries, compounded by regional image problems, all challenge the Corridor's ability to compete with the coastal regions of China in attracting young professionals, and even in retaining them once they are there—most graduates of universities on the Ha-Da-Qi Corridor are being lost to the coastal regions for job opportunities that are more developed and offer higher quality of life. In general, the better the educational institution on the Corridor, the higher the out-migration after graduation; for the Harbin Institute of Technology, the out-migration rate after graduation is over 90 percent.[40] As a result, Forbes magazine ranked Daqing only the 64th best city in China for quality of workforce.

4.2.2. Strategic Options

A high-performing economic corridor is characterized by a workforce that matches the needs of the region's existing and emerging cluster portfolio, and by a network of educational and training institutions that have strong connections with industry. In a similar theme to the Innovation Pipeline, the successful region in human resources has a "Skills Pipeline" that offers strong options along every segment of the educational continuum, and ultimately feeds into the needs of the region's portfolio of clusters.

On the Ha-Da-Qi Corridor, a well-performing Skills Pipeline exists for the oil and gas and agriculture clusters, and to a lesser extent the heavy equipment cluster, but the Corridor lacks the Skills Pipeline to support its other existing and emerging clusters. The Corridor must ensure that its Skills Pipeline is strong at each segment, and that it successfully feeds the needs of its cluster portfolio. This means not simply offering business access to the existing workforce, but improving existing educational institutions and even considering creating entirely new programs,

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38 Sources: 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar; and "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006.

39 Interview, Daqing National Level High-Tech Industry Development Zone - Economic and Technology Development Bureau.

40 Webster, Douglas and Cai, Jianming, *Preliminary SWOT Analysis: Ha-Da-Qi Corridor, Version 5*, August 6, 2006.

and possibly even new universities and colleges, which focus on the needs of the Corridor's targeted clusters. The example below may be a good example to the Ha-Da-Qi Corridor.

STRATEGIC OPTION: BUILDING THE CLUSTER-WORKFORCE SKILLS PIPELINE—
Best Practice Example: Alamo Region, Texas

The State of Texas funded a model that may be useful for Ha-Da-Qi Corridor. This model was developed in the Alamo Region (around San Antonio). The regional workforce organization commissioned ICF to: identify all the clusters in their economy and their growth trends, then identify the types of occupations in each cluster that were growing or declining, and actually bring groups of employers from each cluster together with regional educational providers (community colleges and universities) to work together to define how to better match plans for training with needs of each cluster.

A strategy for building a skills pipeline initiative was then formed, with leadership from the head of the regional workforce organization and a team of regional community colleges and business leaders. This strategy was implemented, focusing on one cluster at a time, improving understanding of demand for specific skills and ensuring that the community colleges would train to the right skill levels or standards. Businesses praised this approach and it continues now as an ongoing practice of better linking training to cluster needs, particularly for rapidly growing clusters, whether financial services or aerospace. The State of Texas is encouraging other regions to adopt this "Skills Pipeline" approach to helping industries meet their workforce needs.

While the Province and some of the Corridor cities have policies that emphasize harnessing the Corridor's educational institutions, such as efforts to improve cooperation between government agencies and universities, the Ha-Da-Qi Corridor authorities should more actively convene a network of national, provincial, and municipal agencies, educational institutions, and industrial representatives to collaborate on building a workforce development system that can provide the skills needed by the Corridor's existing and emerging cluster industries.

4.3. Finance

Priority Level: High

4.3.1. Foundation Assessment

Inadequate availability of risk capital for enterprise growth is frequently cited as an impediment to business development and expansion in the Ha-Da-Qi Corridor. The percentage of small and medium-sized private enterprises (SMEs) with bank loans is several times lower in the Ha-Da-Qi Corridor than elsewhere in China, possibly contributing to the lower number of SMEs on the Corridor than elsewhere in China.[41]

Sources of financing on the Corridor are varied. At the seed capital phase of financing, companies along the Corridor frequently rely on friends and family, although provincial funds, municipal governments, and tech parks are also playing roles. The Heilongjiang Science and Technology Department sponsors commercialization at 160 million yuan, and another 100 million yuan for high-tech R&D.[42] Municipal governments also provide some initiation capital for SMEs (e.g., the city-owned Daqing Commercial and Industrial Guarantee Company guarantees debt up to 40 million yuan) but these investments are frequently reserved for larger, later-stage, high-tech

41 "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China."

42 Interview, Department of Science and Technology of Heilongjiang.

companies.[43] High-tech parks are playing an increasingly important role in helping their tenants fund R&D, obtain capital, and reduce start-up costs in other ways (e.g., with incubators), at all stages of development.

Securing financing at the expansion and maturation stages is equally difficult along the Corridor. Commercial banks are few in number along the Corridor, and those that exist are not very active and frequently seek projects with fixed assets, such as land. CNPC is typically the main financial partner in larger projects such as petrochemicals, but only where the company has an interest. Growing and maturing companies along the Corridor are in particular need of high-end financial services that can help them in such areas as going public in stock exchanges (e.g., Singapore) and in identifying and marketing to domestic and international investors. The Corridor has a shortage of investment banks, international consulting companies, and accounting and law firms. Government at the province and municipal levels has recognized the strong need for financial institutions serving the Ha-Da-Qi Corridor. Daqing is committed to supporting the development of investment companies, guarantee agencies, and financial insurance agencies in order to develop a full range of financial services.[44] The Heilongjiang Provincial Government has recognized a need to both encourage financial institutions to set up branches along the Corridor, and directly provide financing itself. The form that this direct government financing will take will be determined in the 11th Five-Year Plan (2006-2010), and could include financing of infrastructure, preferential bank loan rates, and/or direct investment or co-investment with city and county governments.[45] The Corridor needs to ensure that the necessary level of resources exist on the Corridor—whether offered by the private sector or government agencies—to fund companies through all stages of their development, from Discovery (basic and applied science), to Development (product development and start-up), through to Deployment (enterprise growth, expansion, and transformation).

4.3.2. Strategic Options

High-performing corridors are able—over time—to develop a core of institutions, whether public or private, that provide funding to enterprises at each length of their Innovation Pipeline. High-performing corridors will have risk-oriented investors (whether public or private institutions or high-net-worth individuals) who support enterprise formation (pre-seed and seed capital). High-performing corridors will have institutions that are able to identify, screen, and prepare candidate investment deals to help attract venture fund investors, particularly when there are corridor or regional investment entities that will co-invest (which helps build outside investors' confidence in deals). High-performing corridors also have strong relationships among mature firms and private equity and investment banking firms to help enable raising capital for modernization and mergers or acquisitions. The experience and readiness of investors already on the Corridor will help attract international companies and investors who are often reluctant to place capital in projects in unfamiliar locations.

On the Ha-Da-Qi Corridor, although large state enterprises such as PetroChina have adequate access to financing, for most other enterprises, particularly SMEs, the availability of financing is

[43] Interview, Daqing National Level High-Tech Industry Development Zone, Heilongjiang Dafeng Agriculture Technology Co. Ltd.

[44] Daqing Assessment of Local Industry Structure.

[45] Interview, Ha-Da-Qi Corridor Office.

a major challenge to growth on the Corridor. The Corridor must work to ensure it offers companies an adequacy of financial options along the entire continuum of the Innovation Pipeline. This may mean not just subsidizing land acquisition and building construction, but creating innovative ways to invest in start-ups and expansions, R&D, product prototypes, and pilot productions. Chongqing might serve as an example to the Ha-Da-Qi Corridor, as it is a previously slow-growing metropolitan area that now has a much higher percentage of SMEs with bank loans than the Ha-Da-Qi Corridor.[46]

The case study below is a good example for the Ha-Da-Qi Corridor of a provincial deal generator, funded jointly by the public and private sectors.

STRATEGIC OPTION: PUBLIC-PRIVATE JOINT VENTURE DEAL GENERATOR—
Best Practice Example: Alberta Deal Generator in Alberta, Canada

The Alberta Deal Generator is a provincial deal generator with locations in Calgary and Edmonton in the province of Alberta, Canada. The deal generator was developed by a coalition of city government, industry, and universities, in order to more successfully bring together home-grown entrepreneurs and strong local investors in a region where this had historically been a challenge. In its early years, Edmonton Deal Generator focused on growing its client base and refining a service package to help prepare local young companies for investment. In later years, the sponsoring Edmonton institutions partnered with Calgary institutions to create a province-wide Alberta Deal Generator.[47]

4.4. Land Use
Priority Level: Medium
4.4.1. Foundation Assessment

There is an abundance of unused, relatively cheap land along the Ha-Da-Qi Corridor which can serve as a major asset for the development of virtually all industries—however this land advantage must be sustained and redefined, as in many places the Ha-Da-Qi Corridor's cost advantage is dwindling.[48] In Daqing, industrial land can be 140 RMB/square mile, compared to some southern cities where it could be 600 RMB /sq m. and more.[49] Even with these low land prices, industrial and tech parks frequently offer a range of government-supported incentives to encourage industrial development, including grants for construction, land-cost incentives, start-up capital, incubation services, lab space, and other on-site services such as banks and supermarkets. Industrial and tech parks are frequently sited as well-governed and efficient and effective providers of facilities, infrastructure, services, and funding, for companies that are housed there.[50]

Despite this abundance of land, the Ha-Da-Qi Corridor faces the challenge of using urban planning and creative land assembly and development policies to better rationalize land use and encourage smart growth. New economic zones (containing industrial estates and high-tech zones ranging from

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46 "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China."

47 Alberta Deal Generator website, http://www.tecedmonton.com/DealGenerator.cfm.

48 General Program on the Industrial Layout of Ha-Da-Qi Industrial Corridor, 44.

49 Daqing Assessment of Local Industry Structure.

50 Interview, Daqing National Level High-Tech Industry Development Zone, Overseas Park, Huatai Company, and several other corporate interviews.

the national, to district, to county levels) have been developed in great numbers on greenfields along the Corridor—frequently duplicating the facilities and services of nearby zones and parks—while brownfields in the cities' cores have been ignored.[51] At least 30 such new economic zones exist in Harbin alone.[52] The Corridor must work to better coordinate the development of fewer, higher quality economic zones and tech parks and, where possible, locate them in brownfield sites to promote revitalization of the Corridor's urban cores. The Corridor may also consider the consolidation of existing economic zones and parks in order to create higher quality offerings. Finally, the Corridor should apply smart growth principles to designate certain Corridor areas as economic zones and protect other areas as open space, forests, and other natural resources.

4.4.2. Strategic Options

A high-performing Corridor will have the ability to plan and coordinate land development at three levels—from small sites needed to enable enterprise formation, to aggregation sites with strong micro-economic resources such as industry and technology parks, to broader cross-Corridor "smart growth" policies to balance development of industry, commerce, housing, and environmental considerations. The challenge for the Ha-Da-Qi Corridor is to have a cross-jurisdictional vision for development that links the three scales of development together. This way technology parks are not isolated islands that only contain industries, but are mixed developments that reinforce intelligent goals for the broader corridor—for industry, institutions, housing, and community.

The Corridor and its municipalities must work together to guide land use so that economic zones are established carefully and concertedly, while not duplicating infrastructure and services. Effective industrial development follows clear land use criteria that maximize rational growth, including:

- Prioritization of development of in-fill sites before expanding onto green space, in order to revitalize the urban cores and avoid unproductive sprawl. This might require creating special redevelopment areas in the core cities.
- Coordination of site development approval timing with surrounding or adjacent municipal and regional infrastructure improvements (such as water, sewer, power and roads) to reduce duplication and higher costs;
- Award of development permission for zones, industrial parks and technology parks on the basis of their distinctive market-based and non-competing development themes to avoid unproductive competition; and
- Application of multi-use, cluster-focused development guidelines for zone or park planning to encourage better availability of inputs and amenities for industry and workforce, including suppliers, shared power and waste users/processors, services (logistics, training), transportation, hotels, and possibly housing.

Given these principles, one approach that the Corridor should consider is planning more flexible industry and technology parks to encourage or require mixed use, as shown in the case study below.

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[51] Webster, Douglas, and Cai, Jianming, *Harbin's Future: Notes and Urban Planning Possibilities*, March 24, 2007.

[52] Webster, Douglas, and Cai, Jianming, *Harbin's Future: Notes and Urban Planning Possibilities*, March 24, 2007.

STRATEGIC OPTION: INNOVATIVE LAND USE AND DEVELOPMENT—
Best Practice Example: Centennial Campus, North Carolina

- One interesting example of a creative mixed use for a technology park that could apply to industry parks to some degree is the model of the Centennial Campus in North Carolina. The Centennial Campus is a new state university development site on which the buildings of the university campus are distributed by multidisciplinary education themes (advanced materials, biosciences, and information technology) with commercial business offices and laboratories mixed in along with health care facilities, services, dining, and recreation. The site is walking distance from residential neighborhoods, will eventually have an executive conference center and hotel, linked to a proposed town center of shops, restaurants and leisure areas.
- The logic of mixing uses for commercial development can also apply to industrial areas, making them more economically and socially diverse, improving their attractiveness, worker productivity and quality of life. The key lesson from this case is that carefully-structured diversity in park composition increases the value of the location and maximizes its adaptiveness.

Development zones across the Ha-Da-Qi Corridor should not compete with each other, and they should have substantial differences in their cluster market targets and value-chain development. Given the duplication of facilities and services offered by existing industrial zones and parks, Corridor authorities should consider the consolidation of existing economic zones into more efficient zones that share infrastructure and services.

The Ha-Da-Qi Corridor should also consider the unique opportunity to coalesce its assets in forestry and bio-products and its achievements in environment quality with new creative land use options (and marketing that exhibits these assets). As bioproducts is a growing industry that has promise for the Ha-Da-Qi Corridor, and Harbin in particular is primed to take advantage of its assets in soy and forestry, the Corridor should consider creative land uses that show off the Corridor as being "green," such as green-built tech parks for bioproducts companies. (See the Environment section below). Such creative land assemblies would not only provide incentives to the bioproducts industry, but would simultaneously serve as best practice examples of creative parks that protect the region's environmental quality and dense forest ecology.

The Corridor should also consider adopting a 'smart growth' approach to land use planning — one which values long-range, regional considerations of sustainability over short-term growth. Planning efforts should focus on balancing the complex relationships between economic development, environmental sustainability, and social well-being. Corridor development plans should seek to ensure that industrial development occurs in concert with improvements to transportation infrastructure and housing stocks, and that significant emphasis is placed on environmental sustainability and social equity issues

4.5. Governance
Priority Level: High
4.5.1. Foundation Assessment

The quality of municipal governance is a challenge for firms across the Ha-Da-Qi Corridor, from Harbin to Daqing to Qiqihar. (Note that this section is devoted to assessing *municipal* governance; *corridor* governance will be addressed in chapters to follow). While there are

several positive advantages that are offered to businesses in the municipalities along the Corridor, Harbin and Qiqihar suffer from bureaucratic inefficiencies, and Daqing, while the most fiscally strong and well-governed of the Corridor cities, is likely to see its diversifying economy restricted in the future because its municipal government and the delivery of public services are currently dominated by China Petroleum Corporation.

The cities of Harbin, Daqing, and Qiqihar offer many advantages that contribute to a positive business climate. Daqing is the leader on the Corridor in terms of creating a positive business climate, thanks in part to its strong fiscal revenues from corporate tax sharing related to petroleum production.[53] Daqing offers one-stop services that make it the speediest provider of permitting, customs clearance, and other administrative practices on the Corridor; its services are generally viewed as responsive and customer-focused. The Corridor municipalities—Daqing, in particular—will sometimes offer direct financial incentives for industrial development, particularly to businesses in the technology parks. Their incentives include tax "holidays" on corporate taxes, reduced VAT taxes on machinery, and associated inducements, such as low interest rates on loans, free land or factory space, plus funding for R&D. Such incentives appear to be less frequently used in Harbin and Qiqihar, although there is little data on this available.

In spite of these advantages, most of which are isolated to Daqing, there are still major challenges to business climate in the Corridor cities. Confidence in the local courts is a problem across the Corridor; businesses in Daqing, Harbin, and Qiqihar all have far lower levels of confidence in the local courts than do businesses elsewhere in China.[54] Tax rates are also a problem in all the municipalities on the Corridor; businesses in Harbin, Qiqihar, and Daqing all pay higher taxes and administrative fees as a percentage of firm's value-added (measuring between 5.2 and 5.3 percent) than do firms elsewhere in China (where the percentage is around 3.1 percent).[55] Harbin and Qiqihar have far slower permitting and customs clearance procedures than in Daqing and elsewhere in China (sometimes twice as slow).[56] Daqing, however, has its own set of municipal governance problems, focused primarily on its tax structure, in which non-CNPC companies exhibit low confidence, and which may need to be examined and amended in order to successfully grow and diversify economically.[57]

Beyond the municipality-specific challenges listed above, fragmentation and competition among the municipalities on the Corridor creates confusion for businesses and investors, and may contribute to a negative image of the Corridor as a place to do business. The Corridor must overcome competition among municipalities and work to create more business-friendly and consistent tax rates, regulatory policies, and administrative practices across the Corridor. This will require a combination of improvements at both the municipal and Corridor levels.

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53 Webster, Douglas and Cai, Jianming, *Preliminary SWOT Analysis: Ha-Da-Qi Corridor, Version 5*, August 6, 2006.

54 "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006; ADB report; World Bank transport report; and staff estimates.

55 "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006."

56 "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006."

57 Interview, Secretary General of the Financial and Economic Leading Group of Heilongjiang Province.

4.5.2. Strategic Options

Creating a high-performing corridor means ensuring that government at all levels work together to create a positive business climate for enterprises at each stage of their life cycle. The Ha-Da-Qi Corridor must ensure that its municipalities are working together to create a positive business climate, across jurisdictions, that emphasizes the "new traditions" in economic development. While the old tradition in economic development emphasized offering tax incentives and holidays, the new approach is to maximize and reveal to companies their "return on taxation," or what they receive for the taxes they pay. While the old tradition in economic development emphasized deregulation or exceptions to attract companies (often with expenses or consequences for the municipality), the new directions in economic development are to ensure that regulatory processes are streamlined amongst all levels of government in order to enable speedy and easy compliance and minimize uncertainties. While the old tradition of economic development treated businesses as supplicants who had to ask for services, in new directions government services must treat companies as customers and ensure the quality of services offered. There is no manual to guide effective governance, but the overall trend is toward viewing public and private sectors as both being important stakeholders in the economy and toward employing collaborative solutions rather than centrally planned directions.

Each of the municipalities along the Corridor has major challenges to address in order to better serve, and enable the growth of, industry on the Corridor. The Corridor must work to ensure that the problems that have been identified at the municipal level (e.g., slow permitting process, low confidence in tax structure, low confidence in local courts) are addressed and improved, and that these improvements are marketed to industry. Moreover, the Corridor must ensure that municipal authorities are streamlining their offerings so that they are not in competition, but in coordination—offering industry and investors the prospect of working in a region that is well-governed and coordinated, and not a fragmented group of municipalities that are out of communication and in competition with each other. Ultimately the Corridor must ensure that there is a high value delivered to each firm for every yuan of tax, and that every public agency represented on the Corridor is customer-focused and committed to delivery of a quality product.

4.6. Transportation and Logistics

Priority Level: Critical

4.6.1. Foundation Assessment

Transportation and logistics is perhaps the biggest challenge facing the Ha-Da-Qi Corridor. Due to the Corridor's geographic location in northeast China, companies along the Corridor must bear high costs to ship their products to the nearest seaport city of Dalian and beyond—costs that serve to diminish the other cost advantages that the Corridor offers. The World Bank has found that the cost of transportation from Daqing to the nearest port is 1.58 times higher than in the average Chinese city (average of 120 Chinese cities). Cost is not the only issue; capacity and efficiency are also major challenges on the Corridor. As such, most transit-reliant industries—even oil and gas—are at a disadvantage on the Corridor.

The main road and rail resources spanning the Ha-Da-Qi Corridor are riddled with challenges. The major railway resource is the Bin-Zhou Railway, which spans the Corridor and connects to the Rangtong, Bin-Zhou, Jing-Ha, and Ping-Qi Railways at various points along the Corridor. Rail transportation is occasionally the preferred transportation by the private sector because it

can sometimes be 80 percent cheaper (or more) than road transportation.[58] However, CNPC owns the rail system and controls the level at which it is made available for use by the private sector. This being the case, supply falls drastically short of service demanded, and the service that is provided suffers from unpredictability, delays, lack of transparency, and in-transit losses—particularly in the winter season.[59]

The alternative to rail transit is usually road transit. The major road resource is the Sui-Man Highway, which spans the Ha-Da-Qi Corridor and connects at various points to the Tong-San, Ming-Shen, and Jingha Highways. Many firms along the Corridor will opt to pay the higher costs of trucking (which are even higher in the winter) for their non-bulk cargoes for the increased reliability over rail transportation. These costs inevitably affect firm productivity and foreign investment—and in many cases are not even viable for certain businesses.[60]

The Corridor's air transit also falls short of what is demanded. Harbin Airport currently services much of the Corridor, along with Qiqihar Airport, but flights are infrequent and air transit typically only serves products that are small-volume and high value-added. A new airport is under construction for Daqing that is expected to be completed by 2008, but runway capacity will be limited and it will lack intermodal efficiencies with rail and road. In addition, the Corridor's pipe capacity (for chemicals production) also falls short of what is demanded by business.

There have been positive improvements in transportation and logistics on the Corridor in recent years. A new highway is being developed between Qiqihar and Jilin, that will eventually also connect Jilin and Daqing. A new high-speed train is in development between Harbin and Dalian, reducing travel time to four hours. A positive policy change in transportation and logistics along the Corridor has been the designation of some of the zones surrounding the three municipalities on the Corridor as sites for concentrated location of private logistical services. These logistics parks are still in their earliest stages of development, and will likely need to consider coordination at the Corridor level to deliver maximum impact. In addition, their development will need to be aligned with other improvements to the road, highway, rail, and air services on the Corridor. Another positive development is the construction of an Inland Container Terminal in Harbin, which could play an important role in shipping to Vladivostok in Russia.[61]

The Corridor is in need of creative solutions such as these to address what may be its most pressing challenge—transportation and logistics—because corporate investments (such as that of a large petroleum pipe manufacturer interviewed during this process, that chose to build an additional manufacturing plant not in Daqing, but in another province, nearer to the end-user customers) are being diverted from the Ha-Da-Qi Corridor because of the high costs of transporting goods along the Corridor and beyond.

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58 Interview, Department of Science and Technology of Heilongjiang.

59 Source: "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006.

60 "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006.

61 Webster, Douglas and Cai, Jianming, *Preliminary SWOT Analysis: Ha-Da-Qi Corridor, Version 5*, August 6, 2006.

4.6.2. Strategic Options

A high-performing corridor will oversee and ensure the region's successful deployment of transportation and logistics in three dimensions: 1) physical access and communication routes (e.g., rail, roads, highways, pipelines, and cables); 2) transportation and logistics services (e.g., railroads, trucking and warehousing, air service, pipe distribution, telecommunications); and 3) dedicated facilities for market transactions (e.g., multi-modal facilities, whether at airports, rail yards or trucking and warehousing sites). Leading regions today are characterized by high-speed, multi-modal logistical access to major markets. New regional centers for logistics are growing and attracting companies that need the confidence they can competitively serve distant markets.

Case studies of such best practice transportation/logistics centers as Memphis, Tennessee and Columbus, Ohio, both in the U.S., carry similar lessons to be learned, which can be applied to the Ha-Da-Qi Corridor. In each of these cases, it was a strong partnership of public and private stakeholders who jumpstarted the development of key multimodal facilities. In each of these cases, the public-private partnership marketed the concept of a multimodal facility to obtain community support, by identifying and advertising the number of jobs and new revenues that would be added to the region as a result. This was essential to obtaining community support for a new, expensive venture. Also, in each of these cases, the multimodal facilities offered business attraction incentives, such as financing for eligible capital projects at favorable rates, capital leases, operating leases, and synthetic leases. The final lesson learned from these cases is that the private sector must take the lead in coordinating information systems—dependence on publicly-funded or legislated initiatives can cause unnecessary delays.

The example below describes the development of Super Terminal Memphis, the largest joint intermodal facility in the U.S., and is a valuable lesson to the Ha-Da-Qi Corridor.

STRATEGIC OPTION: JOINT INTERMODAL FACILITY—
Best Practice Example: Super Terminal Memphis in Tennessee, U.S.

Super Terminal Memphis is the largest joint inter-modal (truck-rail-barge) facility in the U.S. It was developed in 2001 in Memphis, Tennessee on a 1,000-acre site located at a municipally-owned industrial park that connects to two highways and a 175-acre harbor facility.

- Super Terminal Memphis was jumpstarted by an existing, strong partnership of public and private stakeholders.
- Super Terminal Memphis was a collaborative effort: The County Port Commission invested $28 million for roads, utilities and other infrastructure for development of the terminal, and the Canadian National Railway built terminal facilities to include lead tracks and container yards. State of the art information systems with radio communications were developed for the sites to provide real time updates on all equipment movements, a continuously updated inventory, and the capability to plan equipment staging.
- **Stakeholders marketed the initiative's benefits to build community support**: Stakeholders obtained community support for the inland port by identifying and marketing the number of jobs, new industrial output, and other economic benefits that would be generated by the improvements.

4.7. Power and Utilities
Priority Level: Medium

4.7.1. Foundation Assessment

The low cost, consistent supply, and in many cases surplus supply, of energy (provided by CNPC-owned utilities) is one of the Ha-Da-Qi Corridor's strongest assets for business, especially those that are energy-intensive. Companies frequently cite the Corridor's cheaper and more reliable electricity and natural gas as their reasons for locating along the Corridor. Gas and electricity along the Corridor are more favorable in price and reliability compared with most other Chinese cities. Harbin, Daqing, and Qiqihar all compare favorably with Shenyang and Chongqing with low levels of revenue loss by businesses from deficient power, while Dalian tops the list.[62] In fact, lower cost and greater abundance of natural gas and electricity were what attracted Gungyi (a glass company) from Hong Kong to the Ha-Da-Qi Corridor.[63]

4.7.2. Strategic Options

Despite the present-day energy advantages enjoyed by the Ha-Da-Qi Corridor, in order to ensure the long-term sustainability of these advantages, authorities must begin to address critical long-term challenges related to diversification of energy sources, developing more renewable sources of energy, increasing the energy efficiency of major industrial users, and reducing energy-related pollution.

In the future, the Corridor should convene key stakeholders to consider strategic options including construction of Corridor-long pipelines for biofuels; development of eco-industrial parks that improve energy efficiency of firms located within them; regional partnerships to reduce waste and process it in sustainable ways; and joint city commitments to purchase alternative sources of energy, such as wind energy. Such demand-side commitments (and legislative inducements) to sustainable energy solutions could even develop alongside a seed wind energy industry, as the strong and consistent winds in the region have been cited as presenting an opportunity to develop wind farms.[64]

4.8. Environment

Priority Level: Medium

4.8.1. Foundation Assessment

The Ha-Da-Qi Corridor enjoys a relatively high quality of environment, especially for an industrial region. It enjoys two important rivers, substantial green space and forested areas, and relatively good air quality. Daqing is the leading city on the Corridor in terms of environmental quality.[65] In 2001, Daqing became one of the first cities to meet the State Environmental Protection Agency's national level of environmental standards; the city, along with Qiqihar, has the best air quality on the Corridor.[66]

Despite these achievements, the Corridor is challenged to meet the needs of business and residents for water and waste management—particularly in Harbin. The environmental capacity for sewage discharge on the Corridor is low, due in part to the high saline/alkali content of soils in the

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62 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar; and "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006.

63 Interview, Honggang Glass Park.

64 Webster, Douglas and Cai, Jianming, *Preliminary SWOT Analysis: Ha-Da-Qi Corridor, Version 5*, August 6, 2006.

65 Webster, Douglas and Cai, Jianming, *Preliminary SWOT Analysis: Ha-Da-Qi Corridor, Version 5*, August 6, 2006.

66 "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006.

region.[67] Though Qiqihar and Daqing have adequate industrial waste disposal systems, with 97 and 95 percent of firms respectively meeting environmental standards for wastewater disposal, Harbin lags behind at 92 percent.[68] In addition, the Songhua River in Harbin is one of the most polluted in China, according to the State Environmental Protection Agency (SEPA); high levels of industrial waste and raw sewage are discharged into the river and other bodies of water in Harbin.[69] In addition, Harbin has far fewer days with good air quality (82 percent) than Daqing (97 percent), and higher levels of suspended particles and sulfur dioxide in the air.[70]

4.8.2. Strategic Options

Environmental quality—particularly as it relates to the delivery of water and sewage capacity—are critical factors to enabling business formation, expansion, and retention in any region. A high-performing corridor ensures that environmental quality is attained and preserved, as both a means to enabling business growth, and also as an end unto itself, highly related to the quality of life a region offers its residents. The Ha-Da-Qi Corridor should build upon its existing environmental achievements by (a) addressing its main environmental challenges, namely in water and sanitation; (b) proactively marketing its environmental assets; and (c) exploring new models for sustainable development, including eco-industrial park.

The Corridor must begin by prioritizing the improvement of water and waste management to better serve its residents and businesses. Corridor authorities should work with cluster representatives to identify specific environmental challenges they face and develop strategies to assist them in adopting cleaner technologies and practices. The Ha-Da-Qi Corridor Development Authority can play a critical role in disseminating good practice information throughout the Corridor. For instance, opportunities could be created to share lessons from Daqing's emergence as an environmental leader with other municipalities on the Corridor.

Secondly, the Corridor should embrace and market its environmental credentials. Daqing has some of the best air quality in China, and the rest of the Corridor has significant green space. These achievements should be leveraged in order to grow and attract such eco-friendly industries as the emerging bioproducts industry. The Corridor should consider the unique opportunity to develop creative land use options such as green-built tech parks that show off the Corridor as being environmentally progressive, and are marketed to the emerging bioproducts industry in order to grow and attract businesses with a shared commitment to environmental quality. Such green-built parks would also provide the Corridor with the opportunity to develop pilot green wastewater systems that might offer solutions to the critical water and sewage capacity challenges on the Corridor that must be addressed in order to enable economic growth.

Finally, the Corridor should consider creating eco-industrial parks in which firms are co-located in an environmentally-oriented zone, with the goal of seeking high environmental, economic, and social benefits as well as business excellence. In such a site, firms can experiment with recovery

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67 General Program, 45-47.

68 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar; and "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006.

69 Webster, Douglas and Cai, Jianming, *Preliminary SWOT Analysis: Ha-Da-Qi Corridor, Version 5*, August 6, 2006.

70 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar; and "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006.

and reprocessing of waste and improve management of water and waste. The case study below provides a good example of an eco-industrial park that was developed in Alberta, Canada. The Ha-Da-Qi Corridor should consider adopting innovative approaches such as this to improve capturing of energy, recovery and reprocessing of waste, and management of sewage and water.

STRATEGIC OPTION: LOCALLY-FUNDED ECO-INDUSTRIAL PARK—
Best Practice Example: Innovista in Hinton, Alberta, Canada

Innovista is a 108-acre eco-industrial park under development in the town of Hinton, Alberta, Canada. Planned and managed by the Town of Hinton, the park will use green infrastructure, including on site wastewater treatment and district and renewable energy systems. The site is adjacent to a creek, whose preservation is included in the development plan.

- **The park development process included detailed consideration of diverse stakeholders**: Innovista was planned with detailed consideration of the site's community, industrial, and ecological context, with inputs from local and provincial development agencies, businesses with interests in the park, environmental organizations, local landowners, developers, and industry associations.
- **The park will target businesses that stand to improve profitability by sharing resources, increasing efficiency, and reducing environmental impacts**: Such businesses fit best with the model of eco-industrial networking (EIN) on which the park is based. Current recruitment is focusing on value-added wood products businesses.
- **Green wastewater infrastructure is central to the vision for the park**: Existing and constructed wetlands will provide natural treatment facilities for stormwater and wastewater. All wastewater generated in the park will be treated on site. In addition, businesses will be encouraged to practice water conservation and to re-use wastewater from other businesses onsite or from a wastewater treatment plant.

4.9. Quality of Life
Priority Level: High
4.9.1. Foundation Assessment

Quality of life has been a persistent challenge on the Ha-Da-Qi Corridor and has served as a major impediment to attracting and retaining a high-skilled workforce and business investments. Part of this challenge relates to the need for improvements to housing, healthcare, and social amenities on the Corridor, and the other part of this challenge relates to the need for improved Corridor marketing and communications within China and worldwide. This section will relate solely to the first part of the issue—quality of life challenges—while marketing issues will be addressed in the subsequent section.

The Ha-Da-Qi Corridor has key assets that it offers in quality of life, the most distinguishing of which are affordability of housing (costs for home purchase and construction for a family are far lower on the Corridor than elsewhere in China), the abundance of green space, and the low cost of living.[71]

In most other indicators of quality of life, however, the Corridor falls short, due to major shortcomings in the quality and scope of the Corridor's housing, healthcare, and social amenities.

[71] 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar.

In 2005, Daqing ranked 15th in quality of life among Chinese cities.[72] The results for business are tangible—even when companies on the Corridor offer the same wages as the companies in the coastal regions (and thus are offering a far higher spending power due to a lower cost of living), the Corridor companies continue to lose the workforce to the coastal regions, due to the Corridor's lower quality of life.[73]

Quality of life on the Corridor does not just affect firms' ability to attract and retain its workforce—it also affects businesses' ability to attract new investment. The lack of hospitality services such as hotels and other amenities—along with shortcomings in transportation and telecommunications—have created challenges to attracting high-end domestic investment and foreign direct investment on the Corridor.[74]

4.9.2. Strategic Options

Quality of life is a central facet of a high-performing economy—not only is it an economic foundation that determines the ability of industry to attract and retain a high-skilled workforce, it is also an outcome unto itself, because it is essentially a measure of the level of satisfaction that the region's lifestyle affords its residents. While different regions, cultures and workforces may define certain aspects of quality of life differently, ICF has found that key elements of quality of life that are common across regions are the quality, variety, and affordability of housing, healthcare, and recreation. A successful region or corridor ensures that these important human needs are met for its residents, as both inputs to economic development and as outcomes unto themselves. Economic growth without preservation of quality of life will not be sustainable for long.

Ha-Da-Qi Corridor authorities must collaborate at the Corridor level to develop solutions that provide the quality housing, healthcare, and social amenities needed to attract and retain the young workforce with the "next-generation" skills that are demanded by the Corridor's most competitive, growing, and seed industries. The Corridor cannot simply market its current quality of its amenities– It must help develop and finance affordable housing, health, social services, and recreation solutions.

As a starting point, the Corridor must focus on stemming the loss of graduates from its own universities, who are taking their talents and leaving for coastal China for its better quality of life. The case study below is a good example of a student retention initiative in Philadelphia, Pennsylvania in the U.S., a region that is rich with institutions of higher education, but has historically experienced a severe outflow of graduates from the region.

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72 2005 China City forum in Beijing.

73 Interview, Hua Jian Software Company.

74 Webster, Douglas and Cai, Jianming, *Preliminary SWOT Analysis: Ha-Da-Qi Corridor, Version 5*, August 6, 2006.

STRATEGIC OPTION: CORRIDOR-WIDE STUDENT RETENTION INITIATIVE
Best Practice Example: Campus Philly in Philadelphia, Pennsylvania, U.S.

"Campus Philly" is a student retention initiative launched by a coalition of local government, business, and institutions of higher education in Philadelphia, Pennsylvania, U.S. The Philadelphia region is home to over 40 institutions of higher education, but has historically suffered from a high percentage of students moving out of the region after graduation.

- **The goal of the Campus Philly initiative is to retain the high-skilled workforce for Philadelphia's regional economy**: Campus Philly creates programs that are designed to improve the quality of life of students at each stage of the student lifecycle (prospective, current student, graduate) in order to instill in them a stronger emotional attachment with Philadelphia and ultimately a desire to remain after graduation. These programs include freshmen welcome events, social events, job and internship fairs, and housing connections.
- **Campus Philly is funded by a grant from the City of Philadelphia Department of Commerce**: Campus Philly is a nonprofit organization staffed by a team of current and formers students, funded by the City, and in constant contact with city government, business, higher education, and public institutions.[75]

4.10. Marketing
Priority Level: High
4.10.1. Foundation Assessment

Marketing is a major challenge for the Ha-Da-Qi Corridor and its industry clusters, as even the best-served industries (e.g., energy) are in need of improved branding and promotion of the Corridor in order to attract and retain a high-skilled workforce and domestic and foreign investment. To the extent that the Ha-Da-Qi Corridor is recognized elsewhere in China, it carries a negative "rust belt" image, and on the world stage the Ha-Da-Qi Corridor is relatively unknown.

The Ha-Da-Qi Corridor has a strong portfolio of assets, concentrated in specific economic foundation areas, to market to the rest of China and worldwide. The most distinguishing of its advantages are in energy, land, workforce expertise existing in oil and gas and agriculture and emerging in the bioproducts industry, proximity to Russia, and the variety of incentives for industrial development that are offered by tech parks and government at all levels. Additionally, as the Corridor continues to define its target cluster industries, the Corridor will be able to create proactive marketing that speaks loudly and clearly about the existing and emerging engines of the Corridor economy. The clusters should be the basis for the image of the Corridor that is packaged and marketed domestically and abroad.

Despite these positive assets and the efforts that are happening to create a unified brand for the Corridor, marketing is cited as a major challenge on the Corridor among corporate employees and government officials alike. There is a general agreement that the Corridor's marketing efforts are not of an "international standard" and have not been able to overcome the business and workforce perceptions that the Ha-Da-Qi Corridor is a remote "rust belt" area dominated by "old industry," with a low quality of life. Companies on the Corridor express a broad range of unmet needs in marketing, from developing new product ideas, to matching product designs to world market needs, to identifying and attracting partners and investors by learning to "speak the

[75] Campus Philly website, http://www.campusphilly.org.

language of investors."[76] Corridor companies also need help establishing brand identity—so far only CNPC has been able to do this due to its size and history. These marketing challenges overlap with the Corridor's human resources challenges; the region suffers from a shortage of professional marketing expertise, and is forced to look internationally for this expertise.[77]

4.10.2. Strategic Options

Every successful corridor has grown in part thanks to its advantages in human resources, transportation, or any of the other economic foundations, and in part thanks to marketing capabilities that have packaged and advertised those advantages to other regions and worldwide. A central feature of high-performing corridors is their ability to continually identify the corridor's assets, bring together the corridor's key stakeholders in order to form new products and services, and successfully package and advertise these ideas worldwide. Succeeding in these areas requires knowledge of end-user markets, expertise in selling and distributing products and services, and the ability to create a brand to the outside world to attract business and investors.

With these principles in mind, it is essential to remember that marketing is only effective to the extent that it builds upon the true assets of the corridor, and targets markets that will meet the true developmental needs of the Corridor's cluster portfolio. Corridors that market superficial or entertaining images without substance do not usually succeed. The Ha-Da-Qi Corridor needs to continue its efforts to identify its cluster portfolio, and should use this portfolio, along with the Corridor's major competitive advantages in the economic foundations, as the basis for a clear marketing message about the Corridor. Continuous communication and coordination between key stakeholders is required to ensure that this marketing message is portrayed consistently by provincial and city promotional bureaus, businesses, universities, and other regional players.

The Ha-Da-Qi Corridor's marketing efforts must extend beyond simply assembling data on the Corridor's traditional incentives and features, to actively helping firms develop new products and find new marketing channels to domestic and international markets, and working with firms to develop the best "brand" identity for the Corridor.

Finally, the Corridor must work to ensure that the needed range of professional marketing expertise is present on the Corridor. This is partly a human resources challenge—the Corridor's institutions of higher education are not producing the level of graduates in professional services that are demanded by the region's businesses. The Corridor should consider working more actively with the region's universities to develop new programs and degrees that respond to the region's need for marketing professionals. This would represent a strong step toward a well-functioning Corridor Skills Pipeline.

4.11. Conclusions

The Ha-Da-Qi Corridor offers key advantages, but also has a number of critical weaknesses in its economic input foundations. Each economic foundation has been labeled with a priority level (Critical, High, or Medium) to help inform the prioritization of future initiatives on the Corridor.

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[76] Interview, Daqing National Level High-Tech Industry Development Zone, Heilongjiang Dafeng Agriculture Technology Co. Ltd. This comment was repeated by several other companies interviewed.

[77] As an example of this shortage, currently 50 percent of middle- and high-level marketing managers in Dafeng Agriculture Technology Company come from outside of Daqing. Source: Interview, Daqing National Level High-Tech Industry Development Zone, Heilongjiang Dafeng Agriculture Technology Co. Ltd.

Critical Priority Level

- Transportation and Logistics
- Human Resources

The critical priority foundations—transportation and logistics and human resources—represent the two most pressing challenges to business growth on the Corridor, as informed by primary interviews with key stakeholders and review of secondary data sources on the Corridor. These are challenges that will require highest priority strategic solutions on the Corridor.

High Priority Level

- Innovation
- Finance
- Governance
- Quality of Life
- Marketing

The high priority foundations above represent persistent challenges to business growth on the Corridor as revealed by stakeholders in interview and secondary data sources. These are challenges that will still require high-priority strategic solutions on the Corridor.

Medium Priority Level

- Land Use
- Power and Utilities
- Environment

The medium priority foundations above represent areas in which the Corridor offers key advantages now, but will have to work to sustain and improve in the future. Though these solutions will be important—particularly in the long-term—they do not require as high of priority as the critical and high priority foundations above.

In order to leverage the level of resources and effort necessary to begin to create solutions on the Corridor for these critical-priority and high-priority areas, a new organization needs to be created that brings together all the different organizations across the Corridor (cluster businesses, foundation institutions, government agencies at all levels, from all metro-regions) on an ongoing basis. This organization will serve as the mechanism for the Corridor's marketplace to come together to identify shared challenges and build collaborative solutions that will make the Corridor a more competitive place in the global economy. The following chapter describes how this new organization should be developed.

5. Corridor Management Recommendations

ICF has found that improving economic development in a region or corridor depends significantly on coordinating the decisions of many corporations, institutions, municipal agencies, provincial commissions, and national programs. The provincial Ha-Da-Qi Corridor Office has authority over certain policies on the Corridor, but much is controlled by other agencies. ICF believes that effective development of the Ha-Da-Qi Corridor will require the establishment of a new organizational mechanism to enhance Corridor-wide governance and effectively engage the participation of the clusters across the Corridor, as well as the economic input institutions that have the potential to create advantages for those clusters.

Steps have already been taken on the Ha-Da-Qi Corridor toward the development of collaborative solutions to ensure the competitiveness of the Corridor. The Province has already established four major areas of policy—land use, finance, innovation, and investment—with 29 specific articles intended to accelerate development on the Corridor. In addition, the Province has established a small Ha-Da-Qi Corridor Office with a modest staff that is primarily responsible for overseeing the 29 articles. These 29 articles appear to be a productive step towards creating a set of Corridor-wide incentives for development. While it is premature to assess the impacts of each of the 29 articles, the Province is to be commended on its initial actions because the four policy areas addressed are consistent with several of the priority foundation issues identified by this study.

These are strong efforts, but more is needed. The Governor of Heilongjiang Province now has the opportunity to consider how best to expand the Corridor organization and policies to accelerate development. A new and more aggressive approach, may be needed for the Ha-Da-Qi Corridor to compete with the Shenyang corridor initiatives in neighboring Liaoning Province as well as other coastal centers in the Northeast

5.1. Structural Options

ICF believes that the Province should significantly expand the role of the Ha-Da-Qi Corridor Office as a Corridor partnership. This formal structure could be called the Ha-Da-Qi Development Authority. It would be a Corridor-wide governance structure to coordinate the development and deployment of policies and resources across the Corridor. ICF believes that the best structure to enable the success of this organization would be a formal corridor agency structure with deliberately inclusive membership that can make its own investments, manage provincial policies, and perhaps most importantly, coordinate development by provincial agencies and municipalities.

Alternatively, this collaborative model could be adopted with less formal structure and power. A multi-jurisdictional association or network could be formed and managed by the Province, without any formal financial or programmatic authority but guiding policy and coordinating decisions by the Province and the corridor's municipalities. In this model, provincial authorities would simply invite delegates from each cluster, economic input foundation, and metro-region to participate in a more informal Corridor Partnership.

Such new organizational mechanisms—formal or informal—will help to avoid fragmentation of efforts among municipalities and enable the development and deployment of Corridor-wide development initiatives such as those identified this report—focusing a wide array of industry,

Provincial, and municipal capabilities on the needs of individual priority clusters and on longer-term shared and coordinated economic input advantages for the overall Corridor.

5.2. Roles

The key to effective leadership of the Ha-Da-Qi Corridor Development Authority will be to promote the active participation of representatives from clusters, foundations, municipalities and their agencies, providing representation from across the jurisdictions served on the Corridor. In this manner, the Ha-Da-Qi Corridor Development Authority will always be informed and guided by the Corridor's economic engines (producers) as well as the suppliers of key economic inputs. Representatives should be drawn from among people who have the overall development of the Corridor economy as their priority, without any conflicts of interest that would interfere with overall Ha-Da-Qi Corridor development. This should include leaders from:

- **Provincial Clusters**: These will consist of existing *and* emerging industries from across the corridor. Businesses preferably with operations in multiple municipalities or zones.
- **Provincial Institutions**: Provincial universities, provincial ministries, commissions, and agencies (environment, power, water, waste, rail, roads, and highways).
- **Municipalities and their Agencies**: Representatives able to see the importance of the Corridor beyond their own jurisdiction and its districts, parks or zones.

If candidates are to be appointed by the Governor, a procedure should be employed for selecting candidates that ensures diversity of representatives.

To guide the Corridor organization a leadership or 'stewardship" group is recommended. This will comprise a subset of representatives from across the Corridor jurisdictions, technology parks and the industries that comprise those jurisdictions. The key is for these "stewards" to be leaders who have the "bigger picture" of the Corridor and be willing to focus the attention of their peers on shared development objectives.

5.3. Activities

The Ha-Da-Qi Corridor Development Authority should serve as the venue to convene the representatives of the clusters (the output side of the economy) with representatives of the economic foundation institutions and provincial and municipal institutions and agencies (the input side of the economy) in order to develop very specific reforms, policies, programs, and practices. Activities to be coordinated by the Ha-Da-Qi Corridor Development Authority include:

- Cluster-specific initiatives in priority industries.
- Cross-cluster foundation initiatives in innovation, human resources, finance, land use, transportation and logistics, power, environment, governance, quality of life, or marketing needs.
- Promoting and monitoring implementation of the 29 Provincial policies already in place and actively coordinating with Provincial ministries to develop and maintain advantages along the Corridor.
- Establishing baseline measures of the Corridor's overall economic performance, cluster performance, and economic foundations capacities and tracking changes over time.
- Promoting a smart-growth approach to regional development which balances economic development with environmental sustainability and social well-being.

- Coordinating Corridor-wide branding and marketing initiatives to promote the Ha-Da-Qi Corridor as an attractive place to do business and pursue a career.

5.4. Financing

The Ha-Da-Qi Corridor Development Authority could have powers vested in it by the Province to independently raise capital for development through the issuance of bonds (as described further below) and to make investments in Corridor-wide projects either directly or through intermediaries or franchisees, and either independently or in partnership with specific provincial ministries or municipal agencies.

The Ha-Da-Qi Corridor Development Authority could be legally structured to obtain funding in several ways. Many such development authorities have a portion of funding from one main or parent ministry as well as proportional funding from municipalities served, and national grants or contracts. In addition, many of these authorities are able to raise capital for specific projects through issuing bonds. In the case of China, where there are restrictions on bond issuance by local government agencies, the Ha-Da-Qi Corridor Development Authority might consider the example of Shanghai Chengtou Company Ltd., the Shanghai government's urban infrastructure investment and development company, which has issued enterprise bonds (with National Development and Reform Commission approval as a prerequisite to CSRC approval) in the Y2-5 billion range. The authority could also recover capital invested in projects through fees charged to the direct users of specific infrastructure or through an appropriate provincial tax levy for the Ha-Da-Qi Corridor Development Authority.

5.5. Marketing

Marketing the Ha-Da-Qi Corridor to attract companies from across China and internationally can be effectively achieved if a suitable corridor organization is established and an integrated message is delivered to target markets through strategic channels. Having an anchor or unifying Ha-Da-Qi Corridor Development Authority will, by its very nature, draw together the key stakeholders whose interests and behaviors are important in telling the Corridor story to target markets. Failure to establish a Corridor-wide entity will make marketing more challenging with likely unproductive competition between municipalities as well as technology parks. However, in the interim, as the Province carries out programs to promote the Corridor the following perspectives should be considered:

- **Shared Focus on "Vital Cycle"**: Part of effective marketing of the Ha-Da-Qi Corridor is finding a common rallying point for promoting the Corridor. Having a core theme can help the Corridor stakeholders to prepare and deliver a distinctive offering that will attract attention and interest of industries in target markets. The failure of many corridor or regional marketing organizations is that they develop a story that sounds like all the others and does not distinguish their corridor from the many others that are actively reaching out to industries world-wide. Defining the strategic focus for a large and diverse region, however, is challenging. While finding a single theme for the entire Ha-Da-Qi Corridor is desirable, the goal should not be a distraction from more targeted marketing. ICF believes that showing that the Ha-Da-Qi Corridor offers a "Vital Cycle Advantage" to its industries is illustrative of a contemporary unified marketing theme. However, such a theme is only useful if it can be supported by concrete evidence. This message should be delivered by the highest level authorities to domestic and international audiences.

- **One Theme, Many Paths—Using a Cluster Focus**: To reach industries for recruitment and investment the Ha-Da-Qi Corridor needs to speak directly to each target industry's competitive needs. The best way to do this is to organize representatives from each Corridor cluster and have them speak about the features of the Corridor that are important to them, whether in media or at major conferences. While it is good when each cluster identifies specific attributes of the Corridor that are important and positive, industry representatives should also be able to speak about general features of value in the Corridor. The cluster-based framework focuses marketing not on any one location but on how the Ha-Da-Qi Corridor can deliver competitive advantage for each cluster. Applying this framework in the Ha-Da-Qi Corridor would mean working across the Corridor's industry clusters to learn and understand their target markets and competitive challenges. This knowledge, plus analysis of target recruitment markets and their competitiveness needs, would provide detailed guidelines for the content each cluster's marketing focus. Then, with the knowledge of what specific clusters need and are searching for, the Corridor can assess its economic input advantages. With a solid profile of these cluster-specific input advantages the Corridor can now develop a targeted set of marketing materials for priority industry targets. This is one theme (Vital Cycle Advantage) with many paths—each focusing on a specific cluster and their needs, using specific Ha-Da-Qi Corridor advantages to make the case. As long as the advantages are within the Corridor, the stories are valuable. The goal is to do more than sell. The marketing goal is to build a relation or "community of exchange with target markets" so that Ha-Da-Qi Corridor becomes an extension of their business environment.
- **Building Blocks of Vital Cycle**: Separately from having cluster leaders speak in print or to public audiences about the specific values they find in the Ha-Da-Qi Corridor, it is important to bring together the major providers of economic inputs to speak of Corridor advantages. The Ha-Da-Qi Corridor should use the positive strengths of each economic input foundation to provide support to the unifying theme of "vital cycle advantage." This would require effective documentation and illustration of the comparative advantages of the entire Corridor across all the key categories of economic inputs described earlier: human resources, innovation, finance, land use, logistics, resources, governance, marketing, and quality of life. While this will be useful in support, generally, it will only work well if there are dramatically distinctive advantages in a number of categories. Distinctive track record in skill generation, scientific research, logistical access and other inputs need to be tracked and promoted. You must distinguish the Ha-Da-Qi Corridor's economic input advantages otherwise your stories will sound like every other region's. In a global marketplace, marketing themes are helpful, but their message needs specific details that speak to directly to target audiences.
- **One Message, Many Channels**: There are many ways to deliver important marketing messages to target markets, not all of them broad, many very narrow. Corridor marketing should certainly use a unifying theme to set the stage for specific messages about specific industrial markets and how well they are served by economic inputs from the Corridor. Yet, even with this framework, delivery of these messages is not easy. For this reason even when good marketing content has been prepared, it often fails to use channels that will be perceived and responded to by the target audience. There are no perfect corridor marketing approaches for effectively delivering the message to a target industry. However there are a variety of marketing channels that the Ha-Da-Qi Corridor could consider—once it has a clear story for target markets. Each channel should be chosen to reach a specific market, with a specific message and should be delivered through selected media. Sometimes broad channels, such as public media (newspapers, magazines,

radio, television news, and Internet) are excellent for introducing Corridor achievements and increasing recognition or overcoming poor image. However, each industry needs to be reached and has its own trade shows and professional networks. These need narrower positioning to be effectively reached. Ha-Da-Qi Corridor needs to cultivate industry and industry leaders and showcase their achievements in the media and forums that international firms monitor—domestically and internationally. This approach was provided to Orange County, California, to help build their regional image across multiple municipalities each with their own local marketing priorities. Rather than force municipalities to give up their individual marketing efforts, a regionally focused business leadership group accepted a strategy based on common economic features of the region. To that they also added cluster-specific messages on regional advantage to be delivered by press, industry journals and selected spokesmen at key events locally and in leading industry centers away from the region. In other words a combination of overarching message with cluster-specific story made for stronger regional marketing.

These marketing principles should guide the way the Corridor promotes itself and should be led by a unifying Ha-Da-Qi Corridor Development Authority. These messages and approaches can be put to use in shaping a marketing strategy for the upcoming Harbin-Daqing-Qiqihar International Investment Fair.

5.6. Conclusions

In order to solidify the collaborative regional relationships that are necessary for the Ha-Da-Qi Corridor to create advantages and compete in today's global economy, the Heilongjiang Province should consider the establishment of a Ha-Da-Qi Corridor Development Authority, which would be unlike traditional planning agencies in that it would have direct knowledge of the competitive needs of each cluster, as defined by the cluster delegates, with critical inputs from economic input institutions and provincial and municipal agencies.

The five principles of cluster-based regional economic development should be the foundation for all efforts on the Ha-Da-Qi Corridor. The Province has already taken strong steps, but more is needed. The history of high-performing economies worldwide suggests that effective economic development happens when policies, programs, and practices build up from stakeholders of each cluster and all economic input foundations, enabled by agencies from across the Province and metro-regions of the corridor. The way this can be done is through the establishment of a Ha-Da-Qi Corridor Development Authority, which would formally congregate—on an ongoing basis—the representatives of the economy-driving industries, input foundation institutions, and government agencies, in order to identify shared challenges and develop collaborative solutions that will change the competitiveness of the Ha-Da-Qi Corridor. When the Corridor's directions are determined in such a bottom-up delegation of regional stakeholders, Corridor efforts will be directly responsive to the needs of the Corridor's existing and emerging clusters, new and improving economic input advantages will be created, and the Ha-Da-Qi Corridor and Heilongjiang Province will be distinguished from competing provinces and corridors in the global economy.

7. Daqing Diversification Opportunities

By James Gollub, ICF International[78]

1. Executive Summary

1.1 Objective

The objective of this assignment is to provide consultative advisory services to Heilongjiang Province and Daqing Municipality that will support on-going provincial and local economic development as part of the China CDS Economic Revitalization by Cities in Heilongjiang Province project, supported by the World Bank. The advisory services provided by ICF and reported on in this report focus on Industry Structure Rationalization. Specifically, to provide guidance to assist the municipality of Daqing in the identification of industrial targets on which the municipality might focus in diversifying its economy over time.

1.2 Understanding the Problem: Moving Beyond Oil Industry Dependence

The Daqing regional economy has historically been driven by oil production and refining (see Table 1). Petroleum and natural gas extraction represents almost 62% of the gross industrial output value, and employs close to 117,000 persons, or about 46% of the current labor force. The Daqing crude oil fields are slowly declining in production, although the decline is being mitigated to some extent by enhanced recovery techniques.

The refining industry in Daqing consists of two refineries (a third is in Harbin) that are old and running at less than 100% of utilization capacity, but produce adequate supply for the region. There is petrochemical production derived from this refinery feedstock, however; a high proportion of the total output of Daqing petrochemical intermediates are transported out of the region for production of derivatives (polyethylene, acrylic esters, polypropylene, polystyrene) and consumer products.

The economy in the region is very heavily dependent on rail transportation to move materials such as coal, crude oil, refinery products, petrochemicals, other industrial products, grain, and people. The rail infrastructure capacity appears limited, particularly during winter months, and has consequently also limited regional economic growth. Moreover, cold seasonal weather appears to add to the relative cost of building and operating production facilities in the region, and is a competitive disadvantage for plant infrastructure growth. These challenges are becoming more critical as the Daqing crude oil field declines and the regional government is faced with the need to address long term sustainability of the oil industry and its impact on the economic viability of the region.

Similarly, there is significant production of grain and other food raw material in the region, however over 70% of the grain is transported out of the region to have additional processing done elsewhere in China. This pattern influences the energy area, chemicals, and food supply chains, and creates a perception of the region as a "supplier" of raw materials to other areas of China, but also a region lacking in the infrastructure to add value within the province to those raw materials.

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The Daqing region also has geographical, logistical, and institutional issues to overcome which will require strong provincial and local collaboration in order to prioritize needs and agree on strategic improvements. CNPC's (and its affiliates) influence on the regional economy and its potential influence on new diversification opportunity areas is a major factor to address. This is because the extent of CNPC's control of investment capital and procurement decisions can place significant limitations on diversification and development opportunities. Additionally, from a municipal perspective, there are governance issues that the region struggles with; in particular the rate of return to the municipality (e.g. taxes) is minimal from CNPC. This inhibits the municipalities' ability to re-invest in the region, or fund new businesses, to affect change. Availability of financing for incubator businesses, possible competitive disadvantages (versus global companies) in heavy machinery, and the potential for loss of technical resources to other areas of China (perceived as more aligned with innovation and growth), are also challenges.

1.3 Diversification Opportunities: Leveraging Regional Assets

1.3.1. Introduction

While the challenges are substantial, the region also has significant economic assets and opportunities that can be harnessed, beyond the Daqing oil field. Petrochemical commodity production capacity is high. Beyond this, the province has high levels of coal production, shale oil reserves, and a regional natural gas supply that was enhanced by a major find several years ago. The region has significant agricultural production capacity, and the province is the largest exporter of grain to other provinces in China. There is also evidence that the region is beginning to add greater value to its agricultural commodity strengths through the development of bio-based products.

However, the extensive shipment of commodity products out of the region (crude, coal, gas, petrochemicals, raw food materials, among others) suggests that there should be significant opportunity to add value within the region, if competitive production and distribution conditions can be achieved.

Upstream and downstream development within a number of industries offers the potential for diversifying the Daqing regional economy. The challenge is to find a process to accelerate development within candidate target industries. Starting this process will require overcoming the existing cultural and infrastructure constraints which have limited the diversification activities to this point. To transform the region's economic outlook, new principles need to be applied:

1. **Think regionally**: Daqing needs to use regional outreach to define the stakeholders concerned with diversification, whether public or private, across the municipality, its districts, and development zones.
2. **Focus on clusters**: Daqing needs adopt a consistent way of thinking about the development of upstream and downstream development opportunities in each industry—focusing on enterprise formation, business expansion and industry attraction.
3. **Create input advantage**: To enable cluster development Daqing needs to adopt systematic understanding and thinking about the strengths and weaknesses it has in each category of economic input used by specific industries, so that new advantages can be offered or disadvantages overcome to enable diversification.
4. **Build new collaborative mechanisms**: To create or improve economic input advantages for target clusters, the Daqing region needs to establish new partnership mechanisms to bring

together assets from across municipal, provincial and national agencies, as well as with each industry cluster.

ICF visits to the region to interview numerous stakeholders, and analysis of existing Daqing economic and industry reports provided information for this analysis. This information combined with ICF experience in the key industry areas and in assessing and enabling economic development in regional markets was used to identify recommended diversification opportunities for Daqing to consider. The analysis and recommendations focus on opportunities that leverage existing core assets in the region, which may provide quicker development potential. The ICF analysis does not comprehensively review all possible economic development sectors, such as pharmaceuticals or software, as these fields either do not appear to have as strong base to build on, or, if they grow, may be pulled or pushed forwards by the other clusters. For example, there may be eventual synergies with pharmaceuticals industry arising from bio-product growth (for example, product formulations for consumer markets) or there may be growth in regional software service driven by demand from regional users, eventually leading to export of services to other end user markets.

Building on an established and proven economic development method, ICF has identified opportunity areas key to diversification:

- **Economic Drivers**--Candidate industries for diversification: Including, oil, coal, refining, petrochemical, agriculture, bio-products, among others.
- **Economic Inputs**—Foundations essential to enabling diversification, such as innovation, skills, transportation and logistics, financing, governance/business climate, among other factors, that must be focused on needs of individual industry clusters.

1.3.2. Industry Diversification Candidates

The diversification candidates examined in this study, and which should be further investigated, prioritized and advanced by Daqing include:

Energy & Petrochemicals: Diverse Upstream and Downstream Potential

Oil extraction has been the core business activity in Daqing, with coal and recently, natural gas, also prominent. The region has limited shale oil production, but a recent large find in Mudanjiang, a city in the south of Heilongjiang province, provides significant potential.

The oil supply from the Daqing field is declining. Some activity is focused on efforts to extend the field life; however, more creative options may merit consideration as well. Daqing crude is a primary feedstock to the region's three refineries, which produce fuel for the region as well as petrochemical feedstock supply.

Potential diversification opportunities in the field of Energy Extraction area include:

- **Oil Extraction and Processing:** Actual new conventional oil production from the Daqing region is unlikely. Although Daqing crude production still significantly exceeds local refining capacity, it eventually will decline and jeopardize refinery supply. It is essential to the province as well as China to ensure that access exists to Russian crude via pipeline. Longer term, shale oil may provide some local supply. In addition, it is feasible and likely economic as Daqing crude supply dwindles to consider reversing pipelines which carry Daqing crude to coastal refineries to allow Daqing to process foreign crude.
- **Gas Extraction and Processing:** The discovery of a new, large natural gas field in the Daqing region provides an opportunity for diversification. Based on interviews and published

reports, a gas pipeline will be built to carry the Daqing gas to the Harbin region and, ultimately, to the Beijing region[79]. This option, however does not deliver significant value to the Daqing region. Other considerations could include:

  - **Power generation**: In this application gas would most likely displace coal. Natural gas would provide a clean burning alternative fuel source, which would have some social benefits to the region;
  - **Residential or commercial applications**: Here gas would be used primarily for space heating. This would entail some significant growth in infrastructure in the province (initially Daqing and Harbin) to construct local distribution networks, metering, etc. to physically position gas into homes and buildings.
  - **Feedstock for petrochemical production**: This could provide some additional value added for CNPC, as well as incubator businesses, although this would require some significant collaboration to maximize value and produce products desired in the region.

- **Coal Extraction and Processing:** The Daqing region has very strong expertise in processing capability and in a value chain supporting process industries, due to the existing refinery and petrochemical facilities in the area. This capacity, coupled with the fact that coal is exported from the province, means that the region may be a good candidate for a location of a coal-to-liquid (CTL) facility. Consideration of the optimal product to convert the coal into would require several initiatives:
  - **Upgrade to Coal Gas or Liquid**: Daqing should conduct, possibly with CNPC, technical and economic feasibility studies to utilize existing technology to upgrade coal within the province to gas or liquid products. The entire supply chain would need to be assessed, including whether petrochemical base stocks or refined products, or simply natural gas are the optimal product.
  - **Alternative Fuels**: Review the optimal use of various coal derived fuels in comparison to others. Coal may be best used for generating electricity or steam for heating, and that it may be more beneficial to consider petrochemical options for coal.
- **Shale Oil:** Shale oil is a new diversification opportunity. Heilongjiang province, based on the recent find in Mundanjiang, has the second largest shale oil reserves in China, next to Lianong (Fushun). In addition, there are already two small shale oil producers in the province. Consequently, the diversification opportunity is to work collaboratively with the Heilongjiang region and CNPC to develop shale oil production from the new discovery. This will involve a focused effort on the optimal extraction process for the shale oil, and the assessment of investment needs for the complete supply chain, including processing in refineries. Refining shale oil product may require refinery modifications; however, the shale oil also provides longer term new supply of oil for refineries in the province.
- **Expanded Refining:** In a world and nation of limited refinery capacity and petrochemical supply sources, these assets represent underutilized capacity that could be brought to bear on the market. These assets, owned by CNPC, are not directly within control of the municipality of Daqing or the region. However, they are integral to increasing the contribution of the refining sector to several other industries, most notably petrochemicals, heavy machinery, shale oil processing, and all downstream petrochemical products, and retention of value added in the region. Diversification opportunities which should be explored include:

[79] 28 November 2006; Xinhua News Agency; China National Petroleum Corp, the company said the 78-kilometer pipeline is the founding project for China's gas north-to-south campaign.

- **Improved Feedstock and Intermediate Production**: Modification of refinery configuration through capital investment to increase production of petrochemical feedstock and intermediate products (this is already being done, but additional expansion should be considered).
- **Expansion Linked to Pipeline**: Expansion of refinery capacity to increase production of fuel products, with the intent to integrate with the coincident development of a product pipeline and depot system to supply the region as well as northeast China, including the Beijing region.
- **Enhanced Productivity**: Assess the competitive performance of the Daqing refineries versus leading Chinese and global refineries, and identify potential investments to improve efficiency, yields, and reliability.

- **Petrochemicals:** Retain value added production of petrochemical derivatives and consumer goods in the region, rather than exporting resources as commodities to other areas of China is a key objective. Achieving this will require a number of initiatives:
  - **Prioritize Products**: Conduct an assessment to determine the right products to produce and how to create an enterprise able to fulfill that mission. For instance, can polyethylene or ethylene be turned into Styrofoam, fertilizers, insulation, plastic containers, plastic piping which could be exported from the region?
  - **Identify Barriers**: Identify and address economic factors inhibiting these opportunities from being developed today (logistics and distribution costs? Demand factors?).
  - **Define Regional and Provincial Demand**: Daqing needs to identify the consumer goods that would be of the greatest value to the people of Daqing, the province and the people in neighboring provinces. For instance, insulation may be in demand. If there is insufficient insulation in residences, they should be developing chemical products that promote energy conservation.

Agriculture, Food & Bio-Industries: Leverage New Technologies for Value-Added

- **Agriculture:** Similar to the petrochemical industry, a significant percentage (over 73%) of the crop production is exported. Daqing exports more grain than any province in China. Therefore, there is significant opportunity to add value within the province. Primary agriculture is similar to oil extraction and is a core strength of the Daqing economy. Primary agriculture is fundamental supplier to a number of other industries in Daqing – and in particular to potential bio-industries.

  The diversification opportunity for Daqing is to take primary agriculture (focusing on corn and wheat) and start looking at what it takes to maximize the value of what is produced from the existing soil (both good and bad), as well as for target value-added processes categories of agriculture products. To do this, the major issue to address is how to make the primary agricultural sector stronger and diversified. Initiatives that address the issue include:
  - **Continue to Increase Yield through Innovation**: R&D must be continue to focus on increasing crop yield per acre or expand the season through crop genetics.
  - **Leverage Marginal Soil**: Ways must be found to grow crops on marginal soil. For instance, certain crops may not be appropriate for food but would be adequate as raw materials for bio-fuel production (e.g., switchgrass production for ethanol).
  - **Expand Research on New Value-Added Products**: Expand research into the development of crop techniques for use as bio-fuel production rather than food. Bio-fuel production comes from three areas: starches (sugarcane, corn); animal fat and residue (biodiesel); and biomass (forests). Bio-diesel can come from soy, corn, jatropa, etc. There

is a soy-based biodiesel plant already in the province or being constructed. Given these options, the primary agriculture sector must have the best technology to grow corn as effectively as it can grow soy, rapeseed and other related crops.

- **Food processing:** At present most of the raw crops grown in the region are exported from the province. The diversification opportunity is to take the raw materials and turn them into consumer goods. In addition to logistics and distribution issues and concerns related to raising capital for new enterprises, a major challenge to address is the perception of quality. Western import markets demand the highest quality. The required strategy therefore may be to collaborate with a Western company to establish plants that can bring food processing and packaging to the market consistent with Western standards with respect to food, management, and packaging quality and higher prices.
- **Bio-Industries:** The entire category of bio-fuels represents a diversification opportunity for the region. Daqing and the province have some initial experience with bio-fuels, and are already blending ethanol in gasoline and bio-diesel is being scaled-up. The base agriculture capabilities in the province provide a solid platform to launch a more broad application of bio-industrial products. Potential areas to consider that would broaden and deepen the bio-industries' contribution to Daqing and the province include:
  - **Build Daqing Ethanol Demand**: Grow the capability of Daqing and the province to produce ethanol for blending in gasoline. This may result in the production of more ethanol than could be used in Heilongjiang province; if so, it would be possible to supply neighboring provinces with ethanol. If ethanol could be railed to Beijing and blended in gasoline there, it might improve environmental considerations in the city.
  - **Expand in Cellulosic Ethanol**: Create and grow a cellulosic-based ethanol industry in Daqing and allied with the province, potentially using new agricultural sources (switchgrass) from marginal soil, corn husks (as currently is being tested), or rice straw as raw material.
  - **Grow Bio-Diesel Production**: Develop production of bio-diesel in the Daqing region through use of soy and other raw materials (rapeseed, other grains, animal fats). The production could be blended with diesel fuel produced in CNPC's refineries. This will require coordination with CNPC on the blending as well as quality issues.
  - **Create New Value-Added Bio-Products**: Identify and develop opportunities to produce petrochemicals or pharmaceutical products from bio-based sources. Examples could include the development of bio-based opportunities in the PVC (poly vinyl chloride) market, which would focus on the processing of vinyl chloride monomer to the polymer, including the use of plasticizers based on bio-products, and the increased incorporation of functional fiber and/or cellulose in finished products.

Heavy Machinery/Industrial Equipment: A Cross-cutting Opportunity

- **Heavy Machinery**: There is significant existing business in heavy machinery in the region supporting multiple segments. Opportunities will exist to expand that business as the chemical business and shale oil industries grow. However, this industry must take steps to improve the quality of the machinery and equipment produced to be competitive in a global market, or the growth potential will be limited at best. Interviews have indicated there may be competitive disadvantages in quality of equipment versus more global companies who could be supplying CNPC and other manufacturers.
- **Machinery and Systems**: A different opportunity area for this segment would be to develop the machinery and equipment necessary to provide energy more efficiently to businesses and

consumers (furnaces, water heaters, distributed generation equipment, lighting etc). This could be a fruitful diversification area for this support cluster. However, the growth may require stimulus that Daqing and the provincial government could lead. This stimulus could be improved standards for energy efficiency in buildings, machinery, appliances, etc, with incentives provided to manufacturer's choosing to market energy-conscious products.

1.3.3. Priority Candidates for Diversification

In order to assist local decision-makers in prioritizing among the many candidates for diversification, ICF proposes several criteria that can be used to rank clusters in terms of their economic potential. These include:

- Growth trends and predicted future growth of the cluster, both nationally and globally;
- The presence in Daqing of core industries that provide the industrial base for cluster diversification, the competitive strengths of those industries, and the overall depth of the cluster value chain;
- Predicted potential for upstream and downstream activities that can grow out of core industrial activities; and
- Potential local economic impact for Daqing, in relation to expected investment costs (high impact for low investment is optimal).

Based on these criteria, ICF feels that the clusters with the greatest economic potential for Daqing are: bio-products development, petrochemicals, and value-added food processing. In addition to having strong growth trends and many possibilities for upstream and downstream diversification, they also have good potential to generate local revenue compared with other clusters.

1.4 Economic Input Advantage Needs

As ICF has found throughout its work for regions globally, that economic diversification is enabled by the region through improving key inputs used by producers and suppliers in the value-chain of each industry cluster. Daqing and the Province of Heilongjiang have many public and private assets that provide these inputs—many of which stand out nationally for their quality. However, to enable diversification within the Daqing region, the municipality, districts, zone, industry and technology parks as well as provincial partners need to focus on how to make improvements and advantages that match the needs of their current and future clusters. While in some cases the source of the advantage may be a public entity, such as a school, university or institute, the sources may often need to be private entities, enabled by Daqing or the Province. Examples of areas of priority concern are provided below:

1.4.1. Transportation & Logistics

Due to Daqing's location away from many major end markets, Daqing needs to ensure that goods can move as rapidly and cost effectively as possible to customers. To that end, Daqing faces a need to organize and resolve seasonal transportation and distribution issues that may likely impede different industries:

- **Pipeline**: Resolving pipeline infrastructure development will also be essential to promoting future development of energy and chemical-related cluster segments given locational advantages of coastal regions (near customers and energy delivery infrastructure). CNPC's support in this area is crucial.

- **Rail:** Future diversification of energy and chemical related cluster segments will require resolution of rail service capacity, which if addressed in advance would ease locational decisions.
- **Trucking and Warehousing**: Future trucking and warehousing services will be important, through designated multi-modal centers. Having strong agricultural logistics capabilities, particularly cost effective trucking, would be very important for value-added food processing and bio-product industry growth. Ability to compete with other provinces will require cost effective logistics to get all products to market.

1.4.2. Finance

All regions seeking to form and expand enterprise need to help capital markets work more efficiently. For this to occur, there is a need to on two sides: creating quality business deals that reduce investor risk and aggregating capital in ways that enable enterprise to move through their development stages. Daqing has a reasonably well developed commercial finance capacity but lacks early stage capital. Financing is available to already growing enterprises, expanding into new businesses related to agriculture. Daqing Commercial Bank is currently financing companies in bio-products. For example, they recently made loans to existing companies that make ethanol from corn and process soy. Finding well-qualified, early stage deals is the challenge. To address this need Daqing and the Province should work together to create a formal "deal generator" initiative that combines municipal, provincial and early stage investor equity capital with an effort to screen and prepare new businesses in target clusters. Commercial stage capital will flow more easily to maturing firms if they have already proven themselves able to meet deal qualification requirements early on. The city-owned Daqing Commercial and Industrial Guarantee Company guarantees debt up to 40 million yuan for high-tech companies, including to the ethanol company mentioned above.

1.4.3. Innovation

Daqing has specialized resources and policies that can be further focused to serve emerging industry clusters. The region has strong oil and gas research capacity, which is not under the direction of Daqing and would require strong teaming with national agencies to engage on new themes. The Province and Daqing have distinctive agricultural research capabilities focused primarily on enhancing primary agricultural products, which is essential. However, to diversify, Daqing will need to be able to conduct proactive research and development across the Province and apply it to emerging market needs, particularly in agriculture value-added and bio-products. The National Soybean Seed Quality Resource Center is an important institutional resource whose activities could be advanced to focus on soy-based bio-chemical (paints, plastics). Similarly, The Provincial Agriculture Product Processing Engineering and Technology Research Center can be advanced to focus on increasingly advanced screening of food processing products, harnessing domestic and international knowledge and partners. The logic is to build new market-focused R&D institutes focused on pre-competitive needs of emerging industries in Daqing, supported by existing or prospective industry partners.

1.4.4. Human Resources

As clusters diversify they will require access to workforce with skills that match their skill needs. At present, Daqing is fortunate to have a large and diverse workforce, primarily employed in the oil and gas industry and agriculture. The universities and institutes that have prepared these existing workers are already considering how best to serve new skill demands as they emerge.

These training institutes need to be brought together with current and future employers from target industry clusters early on so that they can plan curricula and offer training or retraining for the new industries—whether related to the diverse elements of energy or specific fields, such as bio-products and bio-fuels. Training partnerships would start small and grow over time. Training for advanced agriculture, food processing and bio-products needs to develop. But institutions are in place in Daqing and the Province that can expand to meet needs for technology and professional skills. Daqing has successfully attracted August First Agriculture University from another Heilongjiang location. The University has education and training programs in food science, life science, plant and animal science and technology. In addition, the University has 10 provincial-level R&D centers, the Ministry of Agriculture Soybean Seed Quality Resource Improvement Center, the Bureau of Land Reclamation Agriculture Research Center. Currently, it is conducting more than 300 R&D projects, including 46 national-level projects. The August First Agriculture University is part of the Province's Science and Technology Bureau's team mission to conduct research in the areas of new product varieties, high efficiency production, and application of bio-technology to agriculture products. Extending these training capabilities specifically into bio-products is a natural extension that will require harnessing provincial and local multidisciplinary research skills, as well as cooperation with international partners. Achieving the same goals with respect to training in fields pertaining to diversification of energy may be more challenging—although the region has strong educational institutions in place.

1.4.5. Land Use

Daqing has well established development zones, industrial parks and technology parks. These provide a solid location and base for packaging diversification deals. To date, however, there has been less effort to focus on these locations as combined, multi-function, locations for cluster diversification. This can and should take place, guided by target industry recruitment and value-chain development objectives. In this approach, the park settings are not treated simply as places to attract industry, but as "economic communities" each with distinctive advantages and co-located to foster enterprise development. These co-located activities might include education and training services, pre-competitive R&D centers, as well as specialized logistical resources. The Soybean high-tech park is an example of where this could take place. The site provides government funded manufacturing space for the Riyuexin Soybean Company and good land and facility use for soybean related technology companies. The firms in the park are prepared to work with other companies at that site on collaborative R&D in new areas of soy product development.

1.4.6. Power and Environment

The cost and reliability of power, water and waste disposal are crucial variables to industrial location decisions, particularly among the industries targeted as candidate diversification opportunities for Daqing. Daqing has some advantages in that regard—lower cost, reliable energy (but with more need for energy in winter). New ideas, such as "eco-industrial parks" to share processing of waste and energy could be of great importance to Daqing. Daqing should be particularly well suited to utilize progressive renewable energy processes in the primary agriculture, value-added food processing and bio-products industries. In fact, all industry or technology park sites in Daqing could be adapted to provide their own strong "eco-industrial" park capacity for value-added food or bio-product development and production where tenant companies can use the waste output of one another's processing activities as fuel or direct energy. These efforts could help reduce the location disadvantages of the Daqing region from winter.

1.4.7. Governance and Business Climate

Regions that attract industry are known for their understanding of the needs of target industries and capacity to respond. For this reason Daqing needs not only to examine all of the capabilities that might influence industry decisions (described above), but also how to ensure that all governmental services provide firms with an integrated and business-friendly set of services. Daqing and the Province have developed and implemented permitting and regulatory procedures for enterprises that do establish a good starting point. If incoming companies could learn the competitive and comparative differences in the Daqing business environment relative to competing regions, that would help make industry location decisions easier. Daqing should consider organizing data on taxes, regulations, and human resource, innovation, finance, logistics, power and environmental resources together to show responsiveness to each target industry in which Daqing is interested in growing.

1.5. Conclusions: Future Prospects for Diversification

There are significant core economic assets in Daqing and the Province that can be leveraged to achieve diversification, but many challenges exist. Achieving diversification will require significant new efforts to structure collaboration. This will require that Daqing engage stakeholders from the municipal and provincial government, industry, academia as well as national agencies and institutes to move diversification activities ahead. Engaging CNPC to collaborate on shaping the future of the Daqing regional economy is one such challenge. However, there are challenges in virtually each category of economic input essential to enabling diversification, whether on improving transportation system and logistics to ensure access to markets, recruiting and sustaining workforce in competition with coastal regions, or addressing the impact of weather or geographic distance from markets on production and distribution. However, well structured collaborative processes can address these needs and accelerate economic diversification.

As summarized above, there are many diversification opportunities available for Daqing to develop. However there are significant challenges that must be overcome before the Daqing region can realize the full potential of these opportunities. ICF believes, based on studies of successful regions and its own hands-on experience, that cluster strategy can organize and accelerate desired economic development steps. We believe that Daqing can apply these steps to move forward in a way that best matches Daqing capabilities. However, the essence of cluster building is to carry out these four steps:

5. **Mobilize—Readiness and Engagement**: Educate and engage partners from across all sectors and institutions of the Daqing region to agree to work together on collaborative solutions to market-based needs.
6. **Analyze—Prepare a Comparative Diagnostic Baseline**: Analyze the Daqing economy in terms of its overall economic performance, identify the structure and competitive position of all clusters (by stage of life cycle) and assess all economic input foundations and their responsiveness to industry needs.
7. **Catalyze—Shape Collaborative Solutions to Formation, Expansion and Attraction**: Bring together the producers, suppliers and key input institutions for each existing and emerging cluster (such as bio-products) and identify the competitive challenges, the actions needed to overcome the challenges to growth, and define collaborative partnerships for each

clusters' development that will serve as realistic, bottom-up, market-driven diversification strategies. Work across these cluster strategies to define region-wide needs and initiatives that will enhance Daqing economic advantage.

8. **Realize—Build a Regional Partnership to Manage Implementation**: Work with regional industry and public sector agencies and institutes to form a Daqing partnership organization, managed by the Daqing municipality—with advisors from other governmental agencies as well as industry—that will coordinate initiatives for each target cluster as well as cross-cutting initiatives needed for Daqing to improve overall advantages for growth.

The First Step: Building Collaborative Partnerships

The collaborative strategy process for cluster development, if effectively carried out, can alleviate many of the challenges facing industry development. Building readiness to collaborate is the key point of departure for shaping Daqing's future:

- **Districts, Zones, Industry and Technology Park Partners**: Reaching out across the Daqing region is essential to starting good strategy. Daqing municipality is a complex metropolitan economy. The municipality and its surrounding districts, zones and technology parks all have much to gain from strengthening their existing planning and development efforts. These efforts can be further reinforced by ensuring that each district, zone and industrial park work together to craft an overall Daqing regional economic strategy. The existing industries and infrastructure need to be viewed as part of a regional portfolio that is market-driven with distinctive advantages matched to each cluster's needs. This is a natural point of departure for future diversification efforts.
- **Provincial Partners**: The Province is an essential force and partner for regional strategy. The Daqing region has geographical, logistical, and institutional issues to overcome which will require strong provincial and local collaboration in order to prioritize needs and agree on strategic improvements. The Ha-Da-Qi Corridor initiative and commitments of the province to transform and grow the economy should bring strong provincial ministry partnership to regional diversification efforts. By working from the bottom-up, with provincial partners at the table, Daqing should be able to build a strong economic case from the regional to the provincial level of decision-making. Daqing should work hard to develop a shared understanding with Provincial partners that building economic strategy up from the regional level to the provincial level makes sense. The conditions are good for this to take place.
- **National Partnership**: Many diversification opportunities will require, at some stage, commitments and active participation of national agencies. The collaboration of CNPC and other national entities is essential to effective diversification. The primary goal for Daqing will be to convince the national government to recognize the economic potential of the Daqing region. Heilongjiang Province should be a strong partner in this effort. Through an effective collaborative strategy process CNPC and the central government should be assisted to recognize and then "buy into" the strengths of the region as base for diversification of the continuum of energy related clusters. If CNPC and the central government can recognize that the Daqing region has assets (e.g., refineries, natural gas, shale, agricultural capacity, an so forth) that are not being fully utilized and that strategic new investment in needed infrastructure (e.g., constructing roads, pipelines, and rail expansions) can protect their current investments and pave the way for future development in the region, then Daqing's development opportunities can be realized.

The Daqing region has distinctive economic assets as well as challenging obstacles to overcome. For these reasons creating new economic development value from these assets will require more than traditional plans. A cohesive, collaborative strategy will be required to take advantage of these assets by harnessing existing regional assets in new ways. This in turn will create the seeds of an economic "vital cycle" that will help attract and grow industries for Daqing's future.

2. Introduction: Objectives and Components

2.1. Objectives

The objective of this assignment is to provide consultative advisory services to Heilongjiang Province and Daqing Municipality that will support on-going provincial and local economic development as part of the China CDS Economic Revitalization by Cities in Heilongjiang Province project, supported by the World Bank. The advisory services provided by ICF and reported on in this report focus on Industry Structure Rationalization. Specifically, to provide guidance to assist the municipality of Daqing in the identification of industrial targets on which the municipality might focus in diversifying its economy over time.

2.2. Report Context

This report, builds on the following completed steps:

- **First Site Visit—Confirmation of Priorities**: ICF visited Beijing, Harbin, and Daqing and conducted a first round of interviews in July 2006. In addition to conducting a first round of interviews with key academic, institutional and government stakeholders, an important facet of this first site visit was to confirm the needs and objectives of the overall assignment through 15 separate interviews and discussions with approximately 25 leaders from Heilongjiang and Daqing.

  The agreed upon priorities for this report arising from the first site meetings were to: provide advice on the focus for future diversification opportunities, provide guidance on the general steps and requirements to realize diversification potential and to provide guidance on how Daqing can build stronger linkages throughout the region to take advantage of established capabilities or assets in Harbin and throughout the Industrial Corridor jurisdiction. A site-visit report describing the substance and findings of the initial visit was provided in a first deliverable, which was submitted to the World Bank in September 2006
- **Second Site Visit—Initial Industry and Institutional Analysis**: In November 2006, members of the ICF team returned to Beijing, Harbin, and Daqing to collect existing background data and to conduct interviews with Daqing industries and institutions, consistent with the ICF cluster-based competitiveness framework. ICF worked with counterparts in Beijing, Heilongjiang Province and Daqing to identify, plan and complete over 30 interviews. The ICF team provided a prepared framework summary and interview questionnaire to introduce interview objectives and subsequently carried out the following types interviews and analysis:
  - **Industry Appraisal**: Interviews to gain a basic appraisal of Daqing oil and gas industry capacity, development directions and perceived down-stream or value-add diversification opportunities.
  - **Economic Foundation Profiles**: Interviews to gain an initial assessment of important economic input foundations that currently support the energy industry in Daqing
  - **Industry Market Trends**: ICF completed limited initial analysis of the directions on oil and gas and related diversification opportunities for Daqing.
- **Third Site Visit—Continued Analysis**: In January 2007, members of the ICF team returned to Heilongjiang (Harbin and Daqing) and conducted additional interviews, focusing on opportunities for diversification in oil and gas, agricultural and the emerging bio-fuels industry. Eleven (11) interviews were conducted with industry (across oil and gas, agriculture and bio-fuels and bio-pesticides sectors), as well as economic input foundation providers to the agricultural industry in Harbin and Daqing. In addition, this third site visit included a

regional workshop at which Mr. James Gollub of ICF introduced best practices in Regional Development based on the ICF framework and case examples. The framework is directly applicable to the diversification strategy process that Daqing may need to carry out to achieve its diversification objectives.

2.3. Report Structure

This report provides a systematic analysis of economic diversification opportunities for Daqing applying the ICF cluster-based development framework, within the limits of the project level of effort.

- **Cluster-based Economic Diversification Framework**: Consistent with the diversification task objectives, interviews and initial analysis carried out by ICF, the report first summarizes the framework for diversification development using cluster strategy and summarizes preliminary recommendations emerging from our work. ICF offers the regional cluster-based value-chain framework for use in examining diversification opportunities, as this is essential to guiding competitive development choices.
- **Daqing Industry Status, Structure, and Cluster Potential**: The report then examines industries believed to have diversification potential and explores upstream and downstream diversification opportunities that merit consideration based on market trends, structural information, and cluster development challenges. This analysis identifies cluster diversification candidates that merit further examination.
- **Economic Input Foundations**: The report examines the characteristics, general strengths and weaknesses of each economic input foundation to provide a consistent profile of assets for industry cluster development. These foundations are important because they, as a whole, are key to enabling diversification and growth. Separately, specific capabilities among these economic input foundations could be harnessed, through diversification strategy, to help form, expand, and attract industries within a target field of diversification.
- **Diversification Opportunities and Directions**: The candidates identified in chapter two and the foundations reviewed in chapter three are reviewed in terms of their initial potential for development. This summary of diversification directions can be used as the basis for Daqing efforts to take more systematic steps in cluster development. Note that this ICF report does not screen candidate opportunities in terms of the policy priorities of the Daqing Oilfield Co, CNPC, SINOPEC, or other agencies whose decision-making is beyond the control of Daqing or Heilongjiang Province. Reflecting the agreement with Daqing leaders, this report on preliminary diversification recommendations identifies opportunities in the context of strengthening and growing existing clusters, focusing primarily on oil and gas.

3. Cluster-based Economic Diversification Framework

3.1. Objectives

A healthy and high performing economy has sufficient diversity to ensure prosperity across economic cycles as well as depth and breadth in each industry in its economic portfolio to provide high quality employment. Due to its history of supplying China's energy needs, Daqing's economic and industrial structure is highly focused on one industry. In fact, Daqing continues to have a highly developed oil and gas sector and dominance in the oil and gas industry in the Ha-Da-Qi region and nationally. However, the future of oil and gas as the major source of employment in Daqing is not certain. Even with continued vitality of oil and gas, Daqing needs to make its economy more diverse and sustainable through economic cycles. Achieving greater diversity in its industrial base will not be easy, but can be accomplished and progress is already being made. To accelerate its progress Daqing needs to have a clear economic diversification strategy that takes into consideration its entire current economic portfolio, opportunities and requirements for enterprise formation, expansion, and attraction.

ICF has been asked to provide advice on potential diversification opportunities, as well as requirements or steps that can be taken to enable Daqing to realize these opportunities. This report identifies the key industry targets or "economic drivers" of the Daqing economy and applies the ICF "cluster development framework" in order to identify cluster development possibilities, including possibilities for upstream and downstream development within each of a series of industry clusters. This report examines a series of industries and their potential. The analysis begins with the largest economic driver of the region, oil and gas, examining both downstream development beyond existing oil, gas in the petrochemical industries including chemical intermediaries and end products, and considers upstream linkages (e.g., oil filed services). The analysis also considers diversification opportunities that involve moving up the value chain from existing commodities in agriculture into emerging industries such as food processing and bio-fuels.

The cluster development framework approach is first introduced to make clear how ICF views diversification opportunities. Then applying the framework, ICF will briefly review the national trends and supply attributes of each industry driver, the structure of the industry in Daqing, including the value chain development of that industry, followed by appraisal of the economic input advantages and disadvantages needed to grow new areas of the economy (fundamentally and relative to competitors), including human resources, finance, innovation, governance, and quality of life. This then sets the stage for identifying the most promising diversification opportunities based on factors such as sectoral growth trends, existence of core industrial activities in Daqing, and the availability of key input advantages.

3.2. Cluster-Based Economic Development

3.2.1. Four Principles, One Path

High performing regional economies are increasingly utilizing a framework for strategy called "cluster-based economic development." This framework focuses on improving the overall performance of a region—its prosperity, sustainability, and quality of life—through building a diverse and deep portfolio of industry drivers called industry clusters. The cluster-based development approach emphasizes enabling and accelerating the formation, expansion, and attraction of businesses within each cluster in a region by providing the set of key economic

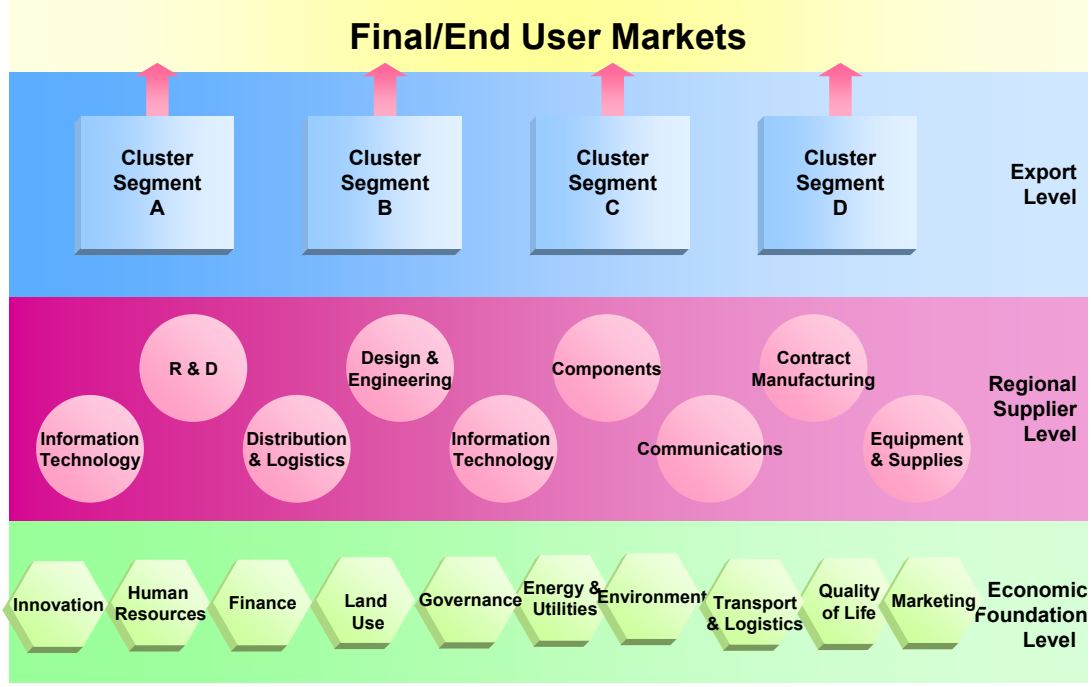
input advantages those clusters need. Metropolitan regions are able to provide the set of inputs or 'foundations' needed by each cluster by collaborating across jurisdictions with public as well as private economic agencies and institutions. A successful regional economy collaborates to create input advantages that change in response to the needs of each cluster as it changes. In this manner a region applying these principles enables a faster pace of enterprise formation, expansion, and attraction within each cluster. This, in turn, enables the overall metropolitan area economy to adapt to broader trends more constructively, thus improving the performance of the region in prosperity, sustainability, and quality of life.

If a city or region wants to develop a robust economy it must recognize these four new realities for economic success:

- **Think Regionally to Compete Globally**: Thinking regionally is essential to economic success. The economy does not recognize jurisdictional boundaries, only sources of economic input advantage. For this reason "thinking regionally to compete globally" is essential to building a high performing economy. A successful metropolitan economy may include a municipality as well as districts, counties, special zones and their technology parks. The simplest definition of a region is the distance that a worker can travel to reasonable reach their place of employment, or, to use a term popular in the West, a region is a "commute-shed." Within a region important economic assets can be created or harnessed to enable competitive capacity in each industry. Enterprises form, expand, and are attracted to the regions that can best supply the economic inputs firms need to compete - inputs such as skilled labor, technological innovation, and access to financing.
- **Focus on Building Clusters**: A region's economic performance is determined, in large part, by the competitiveness of its portfolio of industry clusters. An industry cluster is a concentration of similar companies with related products or services, their key suppliers and supporting "economic input foundation" institutions. High performing economies have a diverse array of clusters that permits adaptation to economic cycles and fosters development of wide range of different capabilities that, in turn, help foster greater development. Daqing has both existing and emerging clusters that need to enhance their product innovation, production efficiency, and marketing effectiveness in order to become competitive and grow. Success in "adding competitiveness" to each existing or new (seed) cluster will result in greater diversity (e.g., diversification) and deeper value-chain development for each cluster in the Daqing-city region.
- **Create Economic Input Advantage**: Regions that have competitive clusters comprising industries with a deep value chain reach this stage of development because they are able to provide their clusters with advantages in economic inputs or "foundations." These advantages are created by having strong and agile public and private institutions that can supply industry with the type of economic inputs that are needed in critical times. The goal of governments that commit to diversifying their regional economies is increasingly on learning what clusters need and then identifying, securing or creating new and improved sources of economic input advantage and making certain these economic inputs are available to industry clusters and change as external market forces and cluster needs demand.
- **Collaborate to Create Advantage**: Leading regions of the world that have developed high performing economies comprised of competitive clusters and strong input advantages have achieved success because they have been able to develop a collaborative culture or "collaborative advantage". This ability of all levels of government, business, and institutions within a region to collaborate on learning and matching advantages to industry needs is the core

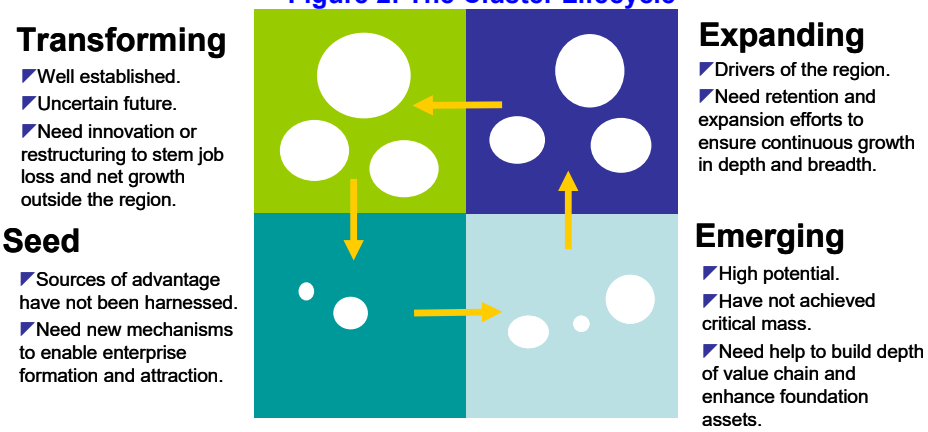
of regional competitiveness. This capacity to collaborate is what enables a region to continually improve its industries and assets, which in turn improves a region's economic performance and makes it more robust over time. While traditional economic development has historically focused on providing low cost land, facilities, and labor matched to a particular company's needs, today's competitive regions go further. Leading regions line up all ministries and institutions, as well as suppliers, to create advantages that are specific to groups of companies, and they change these various inputs over time to continually assure firms that the regional economy and their firm or group of firms are partners in competitiveness.

Figure 1: The Cluster Structure: A "Layer Cake" of Economic Relationships that Create Value



3.2.2. Applying the Cluster Framework

Figure 2: The Cluster Lifecycle



Companies and institutions in the Daqing region have recognized the need for diversification and are already taking positive steps in that direction. There is a constructive readiness to adopt new practices to achieve new results. Identifying diversification opportunities for the Daqing metropolitan region can be enhanced by applying the ICF competitiveness framework. The

cluster-based economic development framework was used to guide field work to profile the structure of Daqing industries and their potential for cluster development, as well as to learn about economic input foundation strengths and weaknesses and determine convergence of potential. By using the cluster logic each of the chapters that follow help prepare the case for new diversification directions.

In the chapter on Daqing industry structure and its potential, ICF examines a set of industrial sectors through the lens of cluster potential. In each selected sector the analysis considers how national growth trends foster demand and how the current Daqing industry structure and capabilities set the stage for potential diversification upstream or downstream from the existing industry sector activities. National trends are utilized to comprehend demand trends and opportunities for sectoral growth as well as likely competition. In some sectors, such as energy, there are a wide range of opportunities for upstream and downstream development. These sectors can grow into clusters through capturing more of the economic value-chain. The same may be true in agriculture as well. ICF believes that certain sectors in Daqing have greater potential for upstream and downstream development than others based on convergence of three critical factors: continuing growth of national demand; an industrial base with competencies that can be exploited for upstream or downstream diversification; and some degree of industry readiness to diversify, whether by national policy, openness to partnering or entrepreneurship.

The results of the field work discussed here have been filtered through and integrated with ICF expertise in the area of cluster development used in other regions of the world as well as knowledge of specific industries and their trends. Based on information collected to-date, a profile of the primary, secondary, and support clusters has been completed to define the major industries driving the Daqing-city regional economy. The existing and emerging clusters examined do not incorporate all of the business activities in the Daqing region, due to priorities of the Daqing client and the scope of this assignment. However, this assessment does represent positive opportunity areas for economic development, and there is clearly both activity and interest that shows there is recognition of the potential of these diversification themes. Risk is always inherent when setting priorities for future diversification strategy. Daqing has a strong set of industry sectors which pose no more risk for future development than other regions in the world

In the next section on Daqing's economic input foundations, ICF considers the strengths and weaknesses that represent sources of advantage that Daqing may be able to utilize or build on to enable and support industry diversification. This chapter focuses primarily on characterizing economic foundations on a general level, with consideration of how these competencies might be particularly helpful to supporting diversification activities around specific clusters. The focus in this chapter is on Daqing's foundations for innovation, human resources, and infrastructure, among other factors, that can be used or improved to enhance cluster development.

The last chapter on diversification options and strategies for Daqing brings together the implications of the two preceding chapters to reach initial conclusions on the potential for economic diversification. In this chapter, ICF considers the candidate field for diversification and highlights the features that make the candidate worthy of further development. These features include elements from the layers of the cluster. First, the existence of Daqing industry capability or demand on which to build or leverage and, second, the set of economic input advantages that might provide support to

enterprise formation, expansion and attraction within and across the development needs of each candidate. Each discussion in this section concludes with a brief summary of proposed developmental steps that could support or accelerated diversification activities.

3.3. Daqing Industry Status, Structure, and Cluster Potential

3.3.1. Introduction

This chapter identifies and assesses the potential for the development of clusters building from existing sectors and industries in Daqing. In each case the report summarizes the national growth conditions surrounding the broader industry; then the analysis briefly examines the characteristics of this industry in Daqing today. Based on an appraisal of domestic and international factors, the report then identifies development directions and opportunities that may be upstream, downstream or both, that can, if sufficiently supported, enable broadening and deepening of the cluster value-chain in Daqing. This chapter provides the "feedstock" that, when combined with the appraisal of Daqing economic input foundation advantages, helps to define a more specific diversification opportunity and strategic direction.

3.3.2. Overview of Daqing Economic Composition

The Daqing regional economy has historically been driven by petroleum and basic petrochemical industries (see Table 1). Petroleum and natural gas extraction represents almost 62% of the gross industrial output value, and employs close to 117,000 persons, or about 46% of the current labor force. The Daqing crude oil fields are slowly declining in production, although the decline is being mitigated to some extent by enhanced recovery techniques.

Currently, the refining facilities in Daqing are relatively old and running at less than 100% of utilization capacity, but produce adequate supply for the region. There is petrochemical production derived from this refinery feedstock, however; a high proportion of the total output of Daqing petrochemical raw materials are transported out of the region for production of derivatives (polyethylene, acrylic esters, polypropylene, polystyrene, etc) and consumer products.

Transportation in Daqing mainly depends on railways and roads. Since a large amount of raw materials and products need to be transported in and out each year, railway and road transport capacity appears to be quite limited, particularly during winter months. This limitation has consequently also limited regional economic growth. Moreover, cold seasonal weather adds to the relative cost of building and operating production facilities in the region, and is a competitive disadvantage for plant infrastructure growth. These challenges are becoming more critical as the Daqing crude oil field declines and the regional government is faced with the need to address long term economic viability of the region.

Table 1: Daqing Main Indicators of Economic Output

Industry	Number of Enterprises 2005[1]	Number of employed persons	Sales revenues (10,000 yuan)	Value-added of industry (10,000 yuan) (current price)	*Gross Industrial Output Value (10,000 yuan) (current price)*
Total	436	253112	24039294	11124169	*22854451*
Coal Quarrying, Washing and Selecting	1	70	2472	1063	*2531*
Petroleum and Natural Gas Extraction	18	116879	15054007	9633654	*14140462*
Agricultural Products Processing	24	6514	252842	91719	*282964*
Food Production	23	3854	141902	38227	*135764*
Beverage Production	5	976	19403	7603	*21303*
Textile Industry	6	2750	27123	7959	*28932*
Textile Clothing, Shoes, and Caps Manufacturing	9	1074	12107	6004	*20977*
Leather, Furs, Down and Related Products	2	268	11360	4690	*13331*
Timber Processing, Bamboo, Cane, Palm Fiber and Straw Products	1	120	1261	275	*1261*
Furniture Manufacturing	6	375	4380	1186	*4718*
Papermaking and Paper Products	14	2444	35358	12980	*37955*
Printing and Record Medium Reproduction	1	161	3315	663	*3301*
Petroleum Processing, Coking and Nuclear Fuel Products	33	29035	5368651	549458	*5447543*
Raw Chemical Materials and Chemical Products	63	12275	672902	197643	*702651*
Rubber Products	2	1638	7344	2128	*8066*
Plastics Products	29	7077	108082	28116	*118888*
Non-metal Mineral Products	35	3172	92116	34892	*93248*
Smelting and Pressing of Ferrous Metals	12	977	40578	14364	*49523*
Metal Products	27	2752	81346	29029	*83858*
General Purpose Equipment Manufacturing Industry	16	1511	31156	9403	*30719*
Special Purpose Equipment Manufacturing	36	4816	155181	40439	*145912*
Transportation Equipment	18	1231	36773	11134	*37612*
Electric Equipment and machinery	19	1445	50721	11725	*50483*
Communication Equipment, Computer and Other Electronic Equipment	3	239	25479	5084	*25991*
Instruments meters, Cultural and Office Machinery	8	471	7264	1811	*7132*
Discard Resources and Materials Recycling	1	30	573	15	*473*
Electricity, Steam Products and Supply	13	49886	1789370	379539	*1350692*
Tap Water Production and Supply	*6*	*616*	*2639*	*1342*	*2974*

Notes:
Major enterprises include all state-owned industrial enterprises and of non-state enterprises with annual sales of over 5 million yuan.
Source: Daqing Statistical Yearbook

While the challenges are substantial, the region also has a number of advantages. These include a strong population center of well educated citizens and extensive universities and technical centers which are viable and productive. Also, the province has high levels of coal production,

shale oil reserves, and a natural gas supply that was enhanced by a major find several years ago. There are also areas of the province with significant agricultural value, and the province is the largest exporter of grain to other provinces in China. There is also evidence that the province is beginning to add greater value to its agricultural commodity strengths through the development of biofuels such as ethanol and biodiesel.

Based on their potential for cluster development, ICF has chosen the following primary regional industries for analysis:

- **Energy**: Extraction, refining and services.
- **Chemicals**: Commodity and specialty chemicals
- **Agriculture**: Primary commodities and value-added food processing.
- **Bio-Products**: An emerging cluster with a new value chain that draws from many others.

ICF has also chosen a number of secondary clusters to investigate that may have related potential for growth. These include the major support industry impacting each of the primary clusters: Heavy Machinery, including Equipment, Fabrication, and Materials. Each of these is integral to the growth and success of each cluster.

The analysis of each industry cluster consists of three components:

- **National Trends**: An assessment of the overall economic performance of each industry from the perspective of national trends and structure. Where data is available, an assessment is provided highlighting whether the industry is growing nationally, what the demand is, and where the production or competition within the industry is from a national perspective.
- **Regional Trends (Daqing Structure)**: An overview of what specific industries presently look like in the Daqing city region. This analysis includes an assessment of the performance and structure of each industry or cluster (e.g., the number of jobs in the industry, the number of enterprises, growth rate and output, etc.). The analysis also examines the cluster structure. This outlines what part of the value chain (depth and breadth) currently exists in Daqing, and ranks (qualitatively) how much of the value chain exists within the region.
- **Cluster Development Challenges**: An appraisal of the competitive challenges facing each industry cluster in the Daqing city region is provided, and a description of constraints to growth within each cluster. The focus is to evaluate the diversity of industry capacity within the value chain of each industry cluster.

Industry 1: Crude Oil Extraction

National and Global Trends and Structure

The global supply of crude oil is forecast to increase at a rate just under 1.0% per year from 2005 through 2030[80] by the International Energy Agency (IEA). China's outlook for crude oil extraction is, however, forecast to decline by 1% per year over the period, with production essentially flat before 2015 and then declining. China's production will decline from 3.6 million barrels per day (MB/D) to 2.8 MB/D in 2030. Over the same period, China's demand for oil is forecast to increase from 6.6 MB/D in 2005 to 15.3 MB/D in 2030, a growth rate of 3.4%, annually. This trend will result in a massive increase in oil import requirements for China and, alternatively, incentive for projects which provide alternatives to oil supply, or which reduce energy usage.

[80] 2006 World Energy Outlook, International Energy Agency, Paris

Daqing Structure

- **Composition**: The energy sector has the potential to contribute to cluster development through a variety of upstream and downstream linkages. The Daqing region has a high degree of its economic activity focused on the extraction of energy from the ground. CNPC's Daqing oilfield has been the #1 oilfield in China for the past 40 years. Well known for its polymer flooding, an enhanced recovery method (Interview, CNPC-Alberta Petroleum Center), it currently accounts for more the one-fourth of China's total crude oil production. Over the past 27 years it has accounted for 40 percent of China's domestic crude production (Interview, CNPC).

  In addition to the Daqing oilfield, a new and large natural gas field was recently discovered and is being developed; and, the province has significant shale oil reserves which remain available to develop as economics or strategy dictate.

  The Daqing region, and the HLJ province, is currently the lead province in China in the oil extractive industry. The province produces about 25% of China's crude oil[81].
  As the following table illustrates, Daqing retains about 25% of the production for regional processing and transports the remaining crude to other regions of China for processing.

Table 2: Daqing Output of Petroleum, Natural Gas, and Products

Output	2001	2002	2003	2004	2005
Crude Oil (10,000 tons)	5150.16	5013.10	4840.03	4640.03	4495.10
Natural Gas (100 million cubic meters)	22.03	20.22	20.34	20.34	24.43
Processing Volume of Crude Oil	1154.12	1120.13	1155.77	1192.54	1234.61

Source: Daqing Statistical Yearbook

Production levels have been maintained through improved extraction techniques using polymer flooding. However Daqing field's production capability will decline over time. Other leading oil exploration activities outside Daqing are now focused on developing largely untapped reserves in the western interior provinces and offshore fields, e.g. heavy oil in Xinjiang province. (Interview, CNPC).

The oil extraction industry has a number of participants. CNPC (China Petroleum and Chemicals Group Company) dominates the industry. However the industry requires support enterprises producing products ranging from pumps, valves, piping to the companies supplying polymers and other technologies to sustain oil production. It is estimated that CNPC and its subsidiaries (including refineries and other petroleum facilities) employ at least half the workers in Daqing (Interview, CNPC-Alberta Petroleum Center).

Daqing is a very strong region for oil resources. It has the best technical skills in the industry, such as at Daqing Petroleum College. (Interview, Daqing National High-Tech Industry Development Zone, Economic and Technology Development Bureau).

- **Cluster Status**: The depth of the oil extraction supply chain is strong, and includes the basic "in-ground" production assets (wells, pumps, tanks, etc). Crude oil pipelines exist in the region to move

[81] According to information from the U.S. Energy Information Agency (EIA)

crude oil to regional refineries, and for export from the region. Crude oil not moved by pipeline is transported by rail. Refineries exist in the region to process the crude oil for local needs.

While it is clear that in the long term Daqing crude production will decline, the oil extraction cluster in the region is a definite regional strength. The decline in crude supply will likely be over a number of years, and the availability of Daqing crude oil to regional refineries should be more than adequate through reductions in the high percentage currently exported.

- **Challenges**: Achieving cluster development in crude oil development in Daqing is highly dependent on national government decisions as well as by the realities of crude oil reserves. The oil extraction industry as a national enterprise has an extremely well developed set of input foundations in Daqing, so there is always potential for development, if national policy so directs. The reduction in Daqing crude supply is a major issue for the region, as is the forecast reduction in crude oil supply for China as a whole. For Daqing, the lower production will mean reduced crude oil exports and a need to find other areas of economic growth to utilize the human and natural resources in the region.

  For China, the increased dependence on imported oil represents an economic and security threat which must be addressed. It is essential that China develop improved energy efficiency practices to reduce energy demand, and to develop alternative energy sources.
  This latter issue is both a critical concern for the nation, and the source of potential opportunity for the Daqing region.

Industry 2: Gas Extraction

National and Global Trends and Structure

Global demand for natural gas is forecast to increase at a pace of 2% annually through 2030. In addition to the sheer increase in demand, gas is becoming a global commodity. Regions with excess natural gas (for example, Qatar and Nigeria) are converting natural gas into liquefied natural gas (LNG) for shipment in refrigerated LNG vessels to regions which are "short" gas supplies. The LNG is regasified and put into the importing countries' distribution system. This "globalization" of natural gas will, over time, mean that natural gas can be a commodity bought, sold, and imported like crude oil.

In China, natural gas demand has mirrored production. China's natural gas demand has been only about 3% of China's total energy demand, and China has consumed only about 3% of the world's gas supply. China was estimated to have about 53 tcf (trillion cubic feet) of gas reserves in January 2006 and consumed about 1.6 tcf in 2004[82]. However, exploration and production of natural gas in China is on the upswing. Production grew by 50% from 1997 to 2002, and the IEA is forecasting average growth of 5% annually from 2005 through 2030.

China's largest gas reserves are in the west and north central regions of the country. In 2006, Sinopec announced two new gas finds, one in northeast China (2.1 tcf reserves), and another major find in Sichuan province (8.9 tcf). In late 2005, CNPC announced a significant finding of 3.5 tcf in Daqing.

[82] *Oil and Gas Journal*, January 2006

There is considerable work being done in China to expand and connect pipeline systems to move natural gas more effectively to major markets. Also, China is developing LNG import regasification terminals near major markets to enable receipt of LNG to fill gas demand. A major terminal is being built at Guangdong (CNPC and BP). Another is under construction in Fujian. As many as a dozen other facilities are being planned or proposed.

While the growth in China through 2030 is at a higher rate than other regions of the world, the lack of a fully integrated distribution infrastructure for natural gas will limit the penetration of the market[83]. This means that access to all consuming sectors is limited. For example, utilities, residential, commercial, and industrial sectors will all require integration with major pipeline distribution networks through local distribution companies.

Daqing Structure

- **Composition**: The natural gas industry in Daqing is changing. While some gas supply exists, (see Table 2) the discovery, development, and distribution of the large new gas field will require production support as well as infrastructure development in the region. While the find is sizable, it is only about 3-4% of China's total natural gas reserves. By contrast, the Daqing field is producing 25% of the nation's crude oil supply.

  Since the gas sector is an emerging cluster in the Daqing-city region, the number of people employed in supporting the gas business is relatively small, but the support required for gas well development is similar to the oil and gas sector.

- **Cluster**: The limited use of natural gas in the Heilongjiang indicates that the natural gas cluster is not at this point a fully formed cluster. In global regions where gas is a fully integrated commodity, gas could be burned in utility plants, commercial buildings, industrial plants, etc. Gas can also be converted into products such as methanol to initiate a chemical or fertilizer-based series of products, or of course LNG.

  Reports indicate that the Daqing gas will primarily be used for industrial customers in the region, and also that a gas pipeline will be built to Harbin to ultimately connect with a North-South pipeline to move the gas into Beijing.

  The Daqing to Harbin gas pipeline is a key first step in developing a deeper supply chain because it links the Daqing gas into a major population center, and then Beijing as well. The development of the ultimate best utilization of the gas resource should be a focus of the diversification strategy.

- **Challenges:** Development of a gas-related cluster in Daqing would build from the strength of growing national and regional demand, a reasonably strong regional reserve, and existence of some important input foundations already in the region. However, the development of this cluster will be primarily shaped by the national government. The new gas supply is an

[83] This means that access to all consuming sectors is limited, e.g., utilities, residential, commercial and industrial sectors will all require integration with major pipeline distribution networks through local distribution companies

excellent asset for the Daqing region. The growth in demand for natural gas in the nation is anticipated to be across all consuming sectors. Since the gas is owned by CNPC, their interests would primarily be focused on getting the highest value or price for the gas. This generally would be through selling the gas to consumers offering the highest price. The challenge will be to find a way to work collaboratively with CNPC to assess the best use for the gas that stimulates the regional economy and satisfies CNPC's requirement to receive a sound return on their investment.

Use of natural gas for power generation would most likely displace coal. Natural gas would provide a clean burning alternative fuel source, which would have some social benefits to the region. Use of the gas for either power or process applications, however, would mean that the coal would have to be moved to markets elsewhere in China. This could worsen transport constraints on the rail system.

Use of gas for residential or commercial applications would entail some significant growth in infrastructure in the province (initially Daqing and Harbin) to construct local distribution networks and metering to physically position gas into homes and buildings. These types of conversions are very slow to occur, and may best be focused in new-construction regions.

Use of gas for chemical production could provide some additional value added for CNPC as well as incubator businesses, although this would require some significant collaboration with companies in the downstream petrochemical sector to maximize value and produce products desired in the region.

Industry 3: Coal Extraction

- **National & Global Trends and Structure**: Global coal usage for energy is forecast to grow at 1.8% per year from 2004 through 2030, according to IEA analysis. China is the largest coal producer and consumer in the world today, consuming, and producing about 33% of all the coal used in the world. China's coal production and demand is forecast to increase at 2.8% per year through 2030, resulting in China's share of the global coal market increasing to 40% by 2030. Coal production in 2004 was 1,960 million tons annually.

  In China, according to the U.S. Energy Information Administration (EIA), coal makes up 69% of China's primary energy consumption. Moreover, China's use of coal increased about 46% from 2002 through 2004. China's major coal producing provinces are Shanxi in the north, and provinces in the south.

  The government is actively promoting the development of projects which turn coal into liquids, including coal liquefaction and coal bed methane.

Daqing Structure

- **Composition:** Coal production in the province, in large measure, is located in eastern Heilongjiang province. Heilongjiang is the sixth largest producer in China, with annual production of about 95 million tons in 2005[84], or about 4-5% of the national supply. Coal is

[84] Source: Xinhua, 2005-12-06

primarily used for power generation in Heilongjiang, and the balance moves through the region to other provinces in China with no value added to Heilongjiang or Daqing.

- **Cluster**: The process of extracting coal and moving it to other provinces appears to be a well-developed supply chain. However, technology does exist to convert coal to liquid fuels (naphtha, gasoline, and diesel), methanol or olefins (key petrochemical feedstock sources) or gas through proven process technology. This could take place in Daqing. Movement of coal from mining sources in Heilongjiang to the Daqing region is already done by rail (on its way elsewhere in China). Rather than export all the coal with no added value, coal can be converted to clean liquids or petrochemical feedstocks through known process technology.

- Technology also exists to turn coal or petroleum coke from refineries, into urea and ammonia (successfully done at a refinery in Kansas in the United States).

  The development of projects of this nature would involve the research community, potentially a partnership with large international technology and/or construction companies, and potentially integration with fuel, gas, or petrochemical markets. In summary, while the existing coal supply chain is adequate for the export process, the breadth of the coal supply chain has opportunity to expand beyond simply burning coal. Daqing's technical expertise in processing as well as heavy machinery strength and research depth would be an exceptional foundation for siting a coal to liquids facility in Daqing. Elimination of some volumes of rail movement out of the Daqing-region would also free up rail space for other goods & commodities.

- **Challenges:** As a potential cluster, coal-based development makes sense as it harnesses an existing physical asset, has the potential of adding value to the energy value chain in specific areas, and can leverage existing processing expertise in the region. The conversion of coal to liquid products is a capital intensive project. In addition, there are already coal-to-liquid (CTL) plants being planned for some other areas in China, and the report of one under consideration in Heilongjiang. The large South African company Sasol, a leader in CTL processing, is well into planning two large facilities in China: "Sasol's two projects, one in Yulin, Northwest China's Shaanxi Province and another in the Ningxia Hui Autonomous Region are designed to produce 80,000 barrels of liquid fuels per day and represent the company's largest investment outside of South Africa. Each plant is expected to cost five billion U.S. dollars to six billion dollars. Should these CTL projects be brought to fruition, they would begin operation about 2013".[85]

  The Daqing region has very strong expertise in processing capability and in a value chain supporting process industries, due to the existing refinery and petrochemical facilities in the area. Hence the Daqing-city region may be a good candidate for a location of a CTL facility. Further analysis is required to determine the optimal product mix to be derived from coal conversion. However, given the existing refinery capacity to produce fuels, it may be more beneficial to consider petrochemical options.

[85] *China Daily*, January 30, 2007

The capital nature of these projects requires a wide margin (price spread) between the liquids produced and the alternate price of the coal raw material. This is a risk that occurs in any venture, but may be a larger risk with a project of this nature due to the wide volatility in fuel and petrochemical commodity prices that has occurred in recent years.

Industry 4: Shale Oil Extraction

- **National & Global Trends and Structure**: Shale oil extraction is a process to remove embedded oil from shale rock. The world has extensive shale oil reserves in a number of countries, with about 86% of the world reserves located in the United States, Russia, and Brazil. Shale oil production is costly, with environmental issues that need to be addressed, but it can be competitive with other fossil based fuels at higher energy cost levels (over $50/barrel of oil).

  Based on information from the 2002 Shale Oil Symposium held in Estonia[86], oil shale production peaked globally in 1980 at 46 million tons/year, declining to 16 million tons in 2000. The current leading producing country is Estonia, with 12 million tons in 2002. Brazil, Germany, China, Australia, and Russia are other producers. The decline in global shale oil production followed the decline in crude oil prices in the 1980's, making it difficult to sustain and grow shale oil production.

  China has very strong shale oil reserves, primarily located in Liaoning (Fushun) and Jilin (Huadian) with 2,000 and 200 million tons of recoverable reserves, respectively. These facilities can produce about 120,000 barrels per day of shale oil for burning or processing. Two locations in HLJ (Yilan and Shuang Ya Shan) have much smaller reserves. Recently, CNPC unit Daqing Oilfield Company discovered oil shale reserves equivalent to 275 million tons (2 billion barrels) of crude in Mudanjiang, a city in the south of Heilongjiang province. This 2006 announcement also indicates that the oil is embedded in over 2.3 billion tons of shale.

Daqing Structure

- **Composition**: The primary resources and employment for shale oil are in Heilongjiang Province, not specifically the Daqing –city region. However, the existence of the two locations in Heilongjiang at Yulin and Shuang Ya Shan (which each produce about 5,000 barrels/day of shale oil) is positive.
- **Cluster**: Conceptually, the extraction of shale oil on a larger scale (with the Mudanjiang source) could create a more defined cluster for the region. Resources to excavate the shale, retort the oil, and handle all the byproducts will be a much deeper infrastructure than the two existing sites. This can be a direct impact on Daqing if the shale oil produced is directed to the Daqing refineries and petrochemical facilities for processing.
- **Challenges**: Given long-term energy trends, development of the shale oil industry and its supply chain has reasonable support. Oil shale builds from a region's physical assets but requires national commitment, extensive capital, and international technical expertise for development. To develop shale oil, leadership from CNPC will be required as well as the support of the central national government. Ideally, China could be a global leader in the development of shale oil production. While it is likely that China may require some foreign investment and technical resources to collaborate on this project, China has the opportunity to

[86] Synthesis published by Dr K. Brendow, World Energy Council, Geneva

be seen as a pioneer in the practical development of shale oil resources. China may be able to leverage Alberta's experience in developing Tar Sands, which has similar, but somewhat less challenging attributes. A relatively new process developed in Alberta to recover oil from solids (the ATP process, or Alberta Taciuk Process) may be an opportunity area to consider to assist in oil shale development.

Shale oil production can either be refined in the region or exported to other refining centers in China. As noted, shale oil production is at the high end of cost for discretionary oil supply. However, it does provide a key source of new, local oil supply for China, and reduces the dependency on imported oil. For the Daqing and HLJ region, it would mean an opportunity for additional revenue, jobs, and could be sustainable over time as the region is seen as global leader in shale oil development.

Several considerations will need to be evaluated:

- Location, scope, and potential reserves of the regions' shale oil reserves, including reasonable estimates of daily production level at maturity.
- Accessibility of the reserves (extraction process, physical handling, etc).
- Method for transport to refining centers (Note that the shale oil extraction must be done at the source, as it would be impractical to transport raw shale to Daqing)
- Quality of the shale oil production.
- Potential investment requirements for the complete development of the supply chain.
- Potential impact on the Daqing and provincial business growth. Shale oil extraction involves extensive use of heavy equipment, which is a regional strength industry.

The main reason shale oil development in Mudanjiang could be a value to Daqing is that the project would need significant use of Daqing's expertise in petroleum, including extraction issues, technical research and analysis, and refining. The Daqing refineries may need to invest to modify their process configuration to process shale oil. That is a benefit to Daqing because ultimately the refineries in Daqing must be modified to process crude oils other than Daqing.

Industry 5: Petroleum Refining

- **National & Global Trends and Structure**: Oil refining on a global basis is seeing a very significant emphasis on additional refinery capacity to meet forecast increases in oil demand over the next decades. Major areas of refinery capacity additions are China, India, and the Middle East. In these locations, there are many new refineries being constructed, planned, and proposed, as well as expansions of existing refineries. In many cases the new facilities have petrochemical facilities being built coincident with the refinery expansions.
  China is in the forefront of refinery expansion. The Chinese refinery industry, primarily composed of CNPC and Sinopec refineries, has a capacity of about 6.2 million barrels per day of crude oil.[87] Major recent expansions and new refineries being planned include:
  - Dalian expansion (CNPC): from 210 to 410 MB/day (completed in 2006)
  - Hainen (Sinopec, new refinery, 2006) 160 TBD
  - Qingdao refinery (Sinopec): 200 TBD in 2008
  - Guangzhou new refinery at Nansha (Sinopec/Kuwait JV): 300 TBD

[87] Source: Oil and Gas Journal, December 18, 2006

- Dushanzi new refinery (CNPC): 200 TBD with large ethylene cracker
- Quangang/Fujian refinery expansion (ExxonMobil/Aramco/Sinopec) from 80 TBD to 240 TBD
- Huizhou new refinery (CNOOC & Shell JV) new refinery and petrochemical plant; 240 TBD[88]

There are no planned capacity additions at the Daqing or HLJ refineries.

Areas where the refineries are being built are primarily along the coast (access to crude imports by water, product export potential, etc), and in very high population and infrastructure growth areas.

Daqing Structure

- **Composition:** The Daqing refineries are old, and have traditionally processed Daqing crude, which is a medium gravity, low sulfur crude. The refineries appear to be running at about 80% of capacity to meet regional demands (in other words, there is available capacity to increase production levels).

  Unlike the crude oil extraction industry in the region, the refining sector represents a relatively small percentage (about 6%) of China's refining industry. However, the refineries and associated chemical plants employ a number of people in the region.

  The refineries appear to have the capability to produce the normal range of transportation fuels as well as a variety of petrochemical feedstocks such as ethylene and polyethylene, and fertilizers.

Table 3: Daqing Crude Oil Processing Products

Output	2001	2002	2003	2004	*2005*
Processing Volume of Crude Oil	1154.12	1120.13	1155.77	1192.54	*1234.61*
Gasoline (10,000 tons)	269.19	286.68	286.46	290.33	*276.37*
Kerosene (10,000 tons)	19	17	17	15	*17*
Lubricant Oil (10,000 tons)	*31*	*17*	*6*	*26*	*32*

Source: Daqing Statistical Yearbook

  There is limited information on the specific refinery production profile, and it appears that the refining sector is the sole source of commodity petrochemicals. It is unclear how the refineries handle the heavy fraction of crude oil (i.e., whether it is blended into residual fuel oil, or if it is upgraded)

- **Cluster**: The refineries are a key asset in the region. The petroleum refining cluster in the region has a well developed value chain. Crude is delivered to the Daqing refineries by pipeline and rail from the Daqing fields. The refineries are comparable in size to other larger refineries in China. Although CNPC typically controls the suppliers of goods and services, there are very strong supporting industries in the region. A full range of products are manufactured and marketed, or are exported from the region.

  The existing refinery configuration appears to be structured for meeting regional transportation demands and base chemical feedstock needs. Interviews with CNPC and Daqing Petrochemical have indicated that expansion of basic chemical production (ethylene

[88] *Platt's Oilgram*, March 9, 2007 reported that Shell may be backing out of this JV.

& propylene) is in process or planned, however development of industries to produce high value added consumer goods is lagging (see Chemical cluster). This appears to indicate that a thorough downstream evaluation of petrochemical demand (regionally and nationally) should be integrated into future Daqing refinery processing investments.

- **Challenges:** Developing further refining capacity and its upstream and downstream value-chain in Daqing has reasonable logic and parallels in other countries. The alignment of the refinery configuration and production mix to the emerging demands of the regional and national markets should be a very high priority. Under the current supply situation in Heilongjiang, it may be difficult to rationalize a new refinery or a major expansion at this time since current fuel demand is being met. CNPC's attention on refinery capacity growth has been elsewhere, since population and economic growth in Heilongjiang seems to lag other areas, such as Coastal regions, of China. However, failure to invest in and exploit the refining industry cluster in Daqing would have serious implications for the region.

Some of these implications would be continued deterioration of the local assets, and potentially migration of oil refining expertise to locations perceived as more desirable for trained workers in the refining industry (into new coastal refineries, for example). While the decline of the Daqing oil field is a reality, however, there is a considerable amount of potential availability of Russian crude supply that can be delivered to the Daqing region, and exports of Daqing crude to other provinces could be reduced as the field production declines. Longer term, shale oil can be developed and refined.

CNPC has control of oil and gas extraction and the first level of refining in Daqing (gas, jet fuel, ethylene, poly ethylene, fertilizer, etc.) Due to the mechanism issue, there is a certain degree of difficulty for external enterprises to enter into the oilfield market. Interviews suggest that non-CNPC ventures cannot gain entry into the Daqing CNPC companies' market due to bureaucratic barriers. The CNPC companies have an internal purchasing/supplier network which is only open to CNPC companies. Outside suppliers have to sell through one of CNPC's Daqing subsidiaries. Since the CNPC Daqing oil company is split into two companies (the Daqing Oil Field Company and the Daqing Petroleum Management Bureau), the Management Bureau has not been doing well financially. However, the internal purchasing network gives the Management Bureau a layer of protection (Interview, Petroleum Research Institute and Heilongjiang Longwei Petro-chemical Company).

The Daqing Commercial Bank said that there are a growing number of small to medium-size companies seeking loans in the area of metal and plastic pipe and related products and materials to serve the oil and gas extraction and refinery industry. Their market is regional as well as national, as they appear to be competitive in serving national markets and are expanding. Local steel and plastic manufacturing is a good match to the existing oil and gas industry knowledge, materials and low energy prices in the Daqing-city region. These types of linkages to the core industry (refining as well as exploration and production) are critical to optimizing a cluster's development.

Given the potential threat to the local refining industry of limited investment in new capacity, and the potential for new sources of crude supply (Russia, shale oil), the region should adopt

an aggressive approach to encouraging investment in the local refining industry. CNPC may want to consider the impact of a possible long term strategy to develop additional refining capacity in the Ha-Da-Qi Corridor region, with the express purpose of providing refined products (and possibly petrochemicals) to the Beijing region by pipeline (somewhat similar to the proposed gas pipeline from Harbin to Beijing). The rationale for this type of initiative would be to take advantage of the core strength in refining and oil infrastructure (people, research, support services, etc) in the region, access to local crude supply, Russian crude supply and, longer term, access to local shale oil. It is conceivable that, with the right infrastructure in place, the Ha-Da-Qi Corridor could become the key refining and distribution center in Northeast China.

While there is no question that the core area of growth in refining capacity will be in coastal regions, Daqing's refineries can be supplied from existing reserves, Russian crude, shale oil, or waterborne imported crude. Ultimately, pipelines which currently move Daqing output to coastal refineries can be used to allow Daqing refineries to process imported crude. This is how refineries in the United States Midwest have been supplied, from waterborne imports into the Gulf Coast and by pipeline imports from a crude rich neighbor (in this case Canada). China should enable imports of Russian crude to move into the Daqing region. This would ensure that the refining assets in the region are fully utilized, support expansion in capacity for fuels and petrochemicals, and mitigate loss of refining expertise to other regions of the country.

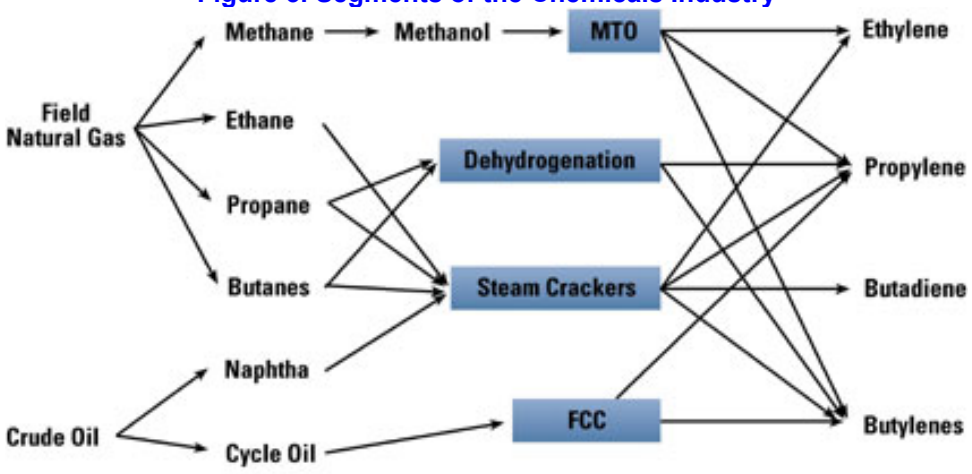
Commensurate with the additional refinery capacity, there will be a need to develop an oil product distribution (pipelines, tanks, etc) network, initially reaching to Beijing and then networking to other regions in the Corridor between Heilongjiang and Beijing. The added refining capacity will enable the production of higher levels of petrochemical basestocks.

A parallel in the United States market would be the Houston area. Houston has become a major refining and petrochemical center, with capacity far in excess of its regional demands. Although Houston does not have surplus crude oil available as does Daqing, it has unlimited access to global crude oil markets by tanker. Houston and other nearby Texas refineries distribute gasoline and distillate to major markets in the United States via pipeline, at distances of up to 1200 miles from the cluster hub. With access to Russian crude supply as well as Daqing crude, it is possible to visualize a similar scenario for the Ha-Da-Qi region as overall Northeast China grows, and for the region to be a key hub of fuel and petrochemical supply. However, this will require development of a product pipeline distribution network, and recognition by the national government that access to Russian crude and robust refining capacity in Daqing is a strategic goal for China.

The potential for shale oil processing may also dictate some refinery investments. While development of the shale oil is likely occur in a ten year time frame, the potential impact of shale oil availability to the local refineries should be a key R&D study focus.
Determining the optimal method and costs for upgrading the Daqing refineries will require a thorough feasibility study of those assets, and the markets for the modified area of products.

Industry 6: Commodity Chemicals & Intermediates
The chemical industry is typically composed of several large segments (see diagram).

Figure 3. Segments of the Chemicals Industry



Source: NOVA Chemicals. http://www.novachem.com/productservices/productservices_coproducts.cfm

The first cluster for further potential development is commodity chemicals. These are the initial large scale source products which ultimately are transformed into consumer goods. Commodity chemicals are of three major types: olefins, oxygenates, and aromatics. Olefins include ethylene and propylene; oxygenates include methanol and ethanol; and, aromatics include styrene, benzene and paraxylene. Each of these product categories are the building blocks for the second segment, intermediate chemical products (for example polyethylene, polypropylene, ethylene glycol, etc), and then, ultimately the derivative chemical products familiar to consumers (plastic bags, containers, and paint, among others).

In addition to these three major commodity chemical supply chains, there is a fourth supply chain focused on the production of chemical fertilizers for the agricultural community. The production of ammonia and urea are key ingredients for the manufacturing of fertilizers. Ammonia is produced from reacting natural gas and air, and urea from reacting carbon dioxide with ammonia. CNPC has significant production of urea on a national basis, but the extent of production in Daqing and Heilongjiang is not clear.

National & Global Trends and Structure

The overall growth in commodity chemical demand worldwide is significant, with ethylene and propylene demand growing at about 4-5% annually, and higher than that in China. Industry analyses of global petrochemical markets indicate that China is likely to be a long term importer of petrochemicals. The expected growth in the use of chemical products for consumer needs in China is very high, and the development of improved agriculture yields and new products will also require growth in chemical fertilizer production.

Historically, North America and Europe have been the largest commodity chemical suppliers. However, the clear trend is for development of world scale petrochemical complexes in the Middle East and in the primary economic growth regions of the world, most particularly China and India. In China, petrochemical complex expansions are in process or planned at a number of existing and planned sites (see refinery section).

Daqing Structure

- **Composition**: The "chemical" cluster in the region is a significant portion of the region's economy. The Daqing region has an existing production of commodity petrochemicals from the refineries, and some level of additional production of intermediate, derivative, and consumer goods (such as polyethylene, polypropylene, urea, etc). However, interviews appear to indicate that significant "value added" beyond these basic commodities and intermediates is not being achieved in Daqing for several reasons:
  - Basestocks and intermediates are exported to other areas in China due to cost issues in the Daqing area (e.g. higher fuel needs in processing due to colder weather) which may make further petrochemical upgrading uncompetitive.
  - Logistics of additional petrochemical derivative production and consumer goods would face constraints in reaching other regions (especially in winter) Due to distribution issues.

  Interviews with CNPC in Beijing, Daqing Petrochemical, other petrochemical suppliers, and the banking community indicate that the production of commodity and intermediate petrochemicals is handled primarily by CNPC (from the refineries). Expansion of ethylene, propylene, and polyethylene & polypropylene is taking place, and it appears from CNPC discussions that the Daqing region has about 10% of China's ethylene production capacity, and that it may double with new projects. There were also large capacity expansions mentioned by CNPC on polyethylene, polypropylene, and urea. However the additional product appears for the most part to be moving outside the Daqing-city region. Fertilizer production appears to be primarily consumed locally.

- **Cluster**: The petrochemical commodity and intermediate cluster in Daqing is a portion of the overall refining cluster and hence, is well developed. The industries and companies providing resources, materials, and technology to the segment are very similar to refining.

- **Challenges**: The petrochemical industry cluster has limited growth opportunity for additional production in Daqing without investment from CNPC, which does have plans for added production. However it appears that the incremental growth is targeted for export out of the region. The challenge is to find opportunities for added downstream upgrading or processing in the region to add economic value locally. The existing production and planned increases are being exported to other national markets to be converted into derivative and consumer products. It will be necessary to demonstrate a higher valued opportunity locally, either through demonstrating local demand or a method to produce consumer goods in the region more cost-effectively than in other regions.

Industry 7: Chemical Derivatives & Consumer Products

National & Global Trends and Structure

The "downstream" chemical supply chain involves the conversion of basic chemical commodities such as ethylene, propylene, benzene, oxides, etc into derivative and consumer products. This segment of the chemical cluster is not a primary focal point of CNPC. However, it represents a significantly large opportunity to leverage the economic supply of commodity and intermediate chemicals produced by CNPC in the region.

Table 4: Daqing Chemical Products

Output	2001	2002	2003	2004	*2005*
Synthetic Ammonia (10,000 tons)	42	43	42	42	*33*
Urea (10,000 tons)	25	25	27	27	*21*
Ethylene (10,000 tons)	50	47	51	46	*56*
Purified Petroleum Benzene (10,000 tons)	9	8	10	8	*9*
Chemical Fiber (10,000 tons)	6.35	6.26	6.57	6.6	*9.8*
Plastic Resin and Copolymer (10,000 tons)	62	61	66	63	*77*
Plastic Products (ton)	*26*	*24*	*35*	*63*	*73*

Source: Daqing Statistical Yearbook

Interviews conducted by ICF revealed that the growth of businesses in the Daqing region to produce derivative and consumer goods is progressing (see table 4). However, there is a great deal of lost opportunity value from commodity and intermediate products moving out of the region to be converted into high value consumer goods elsewhere.

Comparative information suggests that the region is lagging the nation in its share of the development of chemical-based consumer goods and services. Competition appears very high, with some companies indicating in interviews that production plants need to be constructed closer to end-users (in other areas of China) due to costs of production in the Daqing region and transportation uncertainties. So, while the demand growth for consumer goods is very high in all of China, the Daqing region has not been able as yet to enjoy all the benefits of that growth despite a very strong commodity chemical supply.

Daqing Structure

- **Composition**: The extent and breadth of the chemical/consumer product supply chain is very wide. Products from plastic bags to polypropylene based containers, to paint, fibers, piping, insulation, etc. all are part of the process.
- **Challenges**: Building diversity among chemical producers may be possible but requires better demand information. In order to determine the possible opportunity areas for developing deeper and broader supply chains in the region, and realizing the possible value added as economic growth in the region, there must be a clear perspective on the fundamental demand, and demand trends, for each potential value added chemical product. Although such an analysis is outside the scope of this study, the current "flow" of petrochemical products (intermediates, derivatives, and finished products) into and out of the region needs to be assessed. What products are Daqing consumers demanding, and what are the current supply sources for those products? What inhibits local supply of those products, and can the Daqing region provide the product at competitive costs to imports? What can the Daqing-city region and Heilongjiang Province do to enable these investments?

  It is acknowledged that the Daqing region is quite small for petrochemical demand. The intent would be to develop a more efficient market with potential to grow and export to other regions.

  The determination of the optimal strategy for petrochemical growth involves the above issues and, in addition, these factors:
  - **Capacity**: Refinery capability to produce additional petrochemical feedstocks either through upgrades or other modifications to refinery operations.

- **Competition**: Evaluation of the overall growth for petrochemical derivative products in the HLJ region and China overall. A number of petrochemical projects are underway in China, and in the Middle East (with China as a target market for derivative products). It will be important to expand petrochemical business in HLJ/Daqing on a competitive basis with those projects.
- **Target Markets**: Market assessment of the optimal "end products" desired to meet consumer and business needs in the region (for example, products for building insulation, tires for transportation needs, etc.).

With the level of commodity chemical supply available and surplus to the region's current needs, the development of industries to produce chemical based consumer goods in Daqing would have a strong raw material supply source. The existing infrastructure of heavy machinery in the area (primarily supporting oil based business) provides a good core of technology expertise to support the fabrication of required plants and infrastructure for new industries. Making Daqing sourced petrochemical products competitive with products manufactured in other areas of China, or imported, will be a key factor in the sustainability of this cluster segment.

Industry 9: Primary Agriculture

In addition to the Energy and Chemical clusters, Agriculture is a primary focus of the HLJ marketplace. The industry's traditional focus has been on the growth of crops for the needs of the people, as direct food supply and for processed foods. This concentration on meeting national needs for food will continue along with opportunities to produce food in new markets, such as organic food production.

- **National and Global Trends**: The Province's primary crops are corn, soy, wheat, rice, and potatoes, and most of these crops have medium-to-strong national and global market outlooks. Global 2007/08 coarse grain production is projected at a record 1.1 billion tons, up 8 percent from 2006/07; a national increase in corn production in China is expected. Global wheat production for 2007/08 is projected 4 percent higher than in 2006/07, but lower output is expected by China. Global 2007/08 rice production is projected at a record 420.8 million tons, up 4.3 million from 2006/07. Global oilseed production (including soy) for 2007/08 is projected at 399 million tons, down 3.8 million tons from 2006/07. If realized, this will be the first year-to-year decline in global oilseed production since 1995/96. China soybean imports for 2006/07 are projected at 30 million tons—representing a major domestic market opportunity for China to serve.[89]

Daqing Structure

- **Composition**: Agriculture is a major part of the industry portfolio of the Ha-Da-Qi Corridor—but less so in Daqing than in Harbin and Qiqihar. Agriculture makes up 2.4 percent of Daqing's gross industrial output.[90] The traditional focus of the industry in the Heilongjiang Province has been on the growth of crops for the needs of the people, as direct food supply and for processed foods. The upstream activities, including agricultural products processing, are the biggest portion of the agriculture industry on the Corridor. Food and beverage production make up a smaller portion of the industry. The Province's primary crops are corn, soy, wheat, rice, and potatoes. Daqing has good agricultural foundation and plentiful land that is suitable for soybeans, dairy,

[89] World Agricultural Supply and Demand Estimates, United States Department of Agriculture, May 11, 2007, http://www.usda.gov/oce/commodity/wasde/latest.pdf.

[90] 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar.

peanuts, and other products.[91] The interviews identified a significant focus in the region on improving processes and technology to enhance the productivity and season for the growth of crops. The Primary Agriculture sector focuses on crop growth, fertilizers, and food processing. Heilongjiang Province's primary crops are corn, soy, wheat, rice, and potatoes. Total production in 2006 was 75.6 billion tons, with 72% sold to markets outside of Heilongjiang. They export the highest amount of grain out of the province compared to any other province in China.

- **Challenges**: These strong capabilities are threatened by natural issues such as environmental problems (soil is alkaline, drought, cold) as well as food commodities imported, in particular soy. The application of new techniques, technology, and fertilizers to optimize the capability of the soil and the farming industry in the region is essential to the sustainability of the "raw material" supply of primary agricultural crops. The ability to continue to develop the primary agricultural sector is essential to the development of value added food processing as well as the development of agri-based fuels and chemicals.

Industry 10: Organic Products

- **National and Global Trends and Structure**: Worldwide with almost 31 million hectares under organic management in 2007, the sector is rapidly developing in more than 120 countries around the world. According to the "The World of Organic Agriculture 2007, Statistics and Emerging Trends," there are at least 633,891 organic farms in the world and the share of agricultural farmland under organic management is increasing. Oceania leads with 39% of world's organic area followed by Europe at 23% and Latin America at 19%. China surpasses the US in terms of organic farmland with 2.6 million hectares, only being third to leading Australia and Argentina with 11.8 and 3.1 million respectively. In 2006, approximately 1,400 farms had been certified organic.

  In terms of net growth, the report states that Europe and the US have each added 500,000 hectares in the last three years, identifying them as the two regions with highest growth rates. On the other hand, due to the important allocation to pastoral lands, organic farmland in China has decreased.

  According to the same report, global sales of organic food and drink amounted to $33 billion in 2005, a 43% increase from $23 billion in 2002. Organic Monitor expects sales to have grown an addition 21% in 2006, reaching the $40 billion level. Out of the 395 organic certification agencies, 93 are located in Asia, showing the relative importance of the region in the global markets. The IFOAM Accreditation Program assesses certification bodies against a single standard and since 1994 has a Chinese branch, the Organic Food Development Center, SEPA of China.

  Because organic Chinese foods are mainly for export, with only limited distribution nationwide, a parallel 'green food' movement is underway in China aiming to stimulate demand for higher quality, more sustainable food products. In 1990, the Ministry of Agriculture established a China Green Food Development Center to facilitate the production of "non-polluted, safe, high-quality nutritious food" for the domestic market. The Center has 43 offices across the country and its "Green Food Label" - given to items grown with controlled amounts of chemical fertilizers and pesticides - is widely recognized and available in China.

[91] Interview, Daqing National High-Tech Industry Development Zone, Daqing Qingte Food Company Limited.

The most important markets for organic products are Western Europe and North America. Both experiencing undersupply, they have helped fueled China's organic boom of the last few years. China's key export market is Europe, where according to the Organic Monitor Report; the Chinese producers have become established suppliers of organic ingredients. Moreover, China has become the top non-EU source of organic beans and edible seeds to Western Europe. Chinese firms now dominate the supply of organic pumpkin seeds, sunflower seeds, kidney beans, and black beans[92]. According to the International Fund for Agriculture and Development, the value of Chinese organic produce exports grew from around $1 million in the mid-1990s to almost $142 million in 2003, and was expected to reach the $200 million in 2004. Apart from the smaller farmers who cannot afford intensive farming methods, commercially oriented farmers are seeing new market opportunities in certified organic products.

The burgeoning home food market is likely to drive growth in organic farmland, specifically the 'Great Northern Wilderness'. Government initiatives, health concerns and an emergent affluent middle class have transformed the nonexistent domestic local demand of 15 years ago into a booming domestic market. For example, the trendy O Store in Shanghai opened in the fall of 2005 and carries only organic products from roughly 70 domestic producers. Similarly, in Beijing, the environmental group Friends of Nature recently began weekly farm-to-table deliveries of organic in-season produce from nearby Liu Min Ying Ecological Farm.

At a 5-day fair held in Beijing in May 2006, producers form this region sold around 20 tones of organic rice. Sui Fengfu, director of the Agricultural Reclamation Bureau of Heilongjiang pointed out that some of the organic farmland has been "pesticide free" for over 60 years, an amazing effort given China's extensive use of chemicals and bio-technology in agriculture for yield maximization in order to feed a rapidly increasing population.

Despite the increasing domestic market, China's exports continue to be the main driver of growth in the sector. In 2004, total exports of organic products, mainly pumpkin and sunflower seeds and kidney and black beans reached $200 million, a 41% increase from the previous year[93].

Daqing Structure

- **Composition**: According to an article in China Daily of May 2005, the Heilongjiang Province has drafted a new target for the local "green food" industry that includes a value chain upgrade strategy and the development of pesticide use standards. Not specifically organic, green foods have control over pesticide use in production chain. The Province will prioritize three main crops – rice, soybean, and maize, including value added alternatives and aims to certify over 60% of the province's farms as "green" by 2010.

  The Green Food Development Centre (CGFD), a department of China's Green Food Management Office of the Ministry of Agriculture is authorized entity to grant the "green" and organic labels. According to Han Peixin, vice-director of the CGFD, Heilongjiang is the country's leader in the green food industry, both in terms of organic farmland, production, certification, market development, and leading firms. In 2004, provincial exports of certified

[92] http://www.foodnavigator.com/news/news-ng.asp?n=59043-western-food-makers

[93] http://ipsnews.net/news.asp?idnews=33392

green products amounted to almost $1 billion and exports to other countries were $253 million, making the green food industry an important part of Heilongjiang's economy.

- **Cluster Status**: Harbin is the sales hub for green foods with an integral distribution and sales network covering over 400 outlets throughout Heilongjiang, selling 104 different certified organic products. Companies like Heilongjiang Tianyuan Food Co., Ltd Daqing Kanggang Food Co., Ltd and Tieli City Taoshan Tiande Ginseng Development Co., Ltd., are the main exporters of organic soybean, ginseng and other green products.

  Daqing has shown important changes towards more sustainable economic growth, being the "model" city in regards to environmental protection in 2004. This new image could potentially be instrumental in positioning Daqing as a major "green center" in China.
- **Challenges**: Only 15% of China's land is arable (not to be confused with the fact that 7% of the *world's* arable land is in China). According to the Chinese Academy of Sciences if the country were to adopt a nation-wide organic food strategy, the size of cropland would be expanded significantly. To date, farmers have been able to feed the country's population (which represents 20% of the world's population), using just 7% of the world's arable land. They have achieved this through the use of chemical fertilizers, which now represent 75 % of the crop nutrients, compared to 22% thirty years ago.

  Reports of pesticide residues in organic-labeled spinach exported to Japan, the fast growth that the sector is experiencing and China's reputation for lax law enforcement suggests that quality control of products as well as of regulations and certification standards should be a priority for Chinese leaders.

  Du Xiangge of the Beijing Agricultural University doubts that organic farming will become mainstream in China in the near future. With only 10% of the certified organic land allotted to grains and 90% to tea, fruits, and vegetables, the sector remains a niche growing market that accounts for 1% of total food sales.

  The biggest challenge in Chinese agriculture is the lack of arable land relative to the needs of the populations. China has one seventh of the world's arable land but has to feed roughly one fifth of the world's population. Therefore, preserving and improving agricultural land should be one of the most important tasks for Chinese agriculture. During the period between 1958 and 1978, Chinese peasants worked very hard on land improvement projects. However, since the 1979 Reform, large areas of farmland have been lost and continue to be lost to industrial use, tourism, residential and commercial housing, and desertification.

Industry 11: Value Added Food Processing

- **National & Global Trends and Structure**: Many agricultural regions of the world are diversifying away from dependence on the production of undifferentiated agricultural commodities to value-added processing activities focused on demand-driven, specialized markets. The conversion of acres from commodity agricultural production to higher value locally processed bio-mass reduces freight transportation costs and adds to the diversification of the local agricultural economy while reducing the risk of commodity price fluctuations[94]

[94] Read, Carman W. "Industrial BioProducts Discussion Paper & Proposed Business Development Framework for Alberta." C & N Partners, February 2005

The emerging bio-product industry which includes products such as pharmaceuticals, fine chemicals, fuels, building materials and industrial feedstock produced from renewable and sustainable bio-mass sources depends on strong scientific and technological inputs and is representative of this shift towards value added agriculture processing. The agricultural bio-based marketplace in the world is forecasted to reach 50% of agricultural value added processing by 2010 and the global production of crop derived materials for industrial use (vegetable oils, starch, and non-wood fibers) is projected to grow by 56% from 2000-2010, from 47 million to 73 million tones[95] The market for high protein soy processing (removing the shell and fatty acid while leaving the soy protein) is growing as well with China's estimated demand reaching 300,000 tons per year alone.

- **Daqing Structure**: According to figures provided by the Heilongjiang Agricultural Commission, Heilongjiang's agricultural land totals 176 million MU and Heilongjiang exports more grain than any other Chinese province. The province's main commodities include corn, soy, wheat, rice, potatoes, and other grains and production has been very good in the past few years. Total agricultural production in 2006 was 75.6 billion tons, of which 72% was sold to markets outside the province.

  The extent of grain products which are transported out of the region signifies that there is a great opportunity to exploit the availability of grain exports to develop consumer food supplies and provide jobs and revenue in the region. Daqing's strengths lie in grain and livestock processing such as brewing, dairies, meat packing, soy bean processing and feed manufacturing. Daqing Qing Ji Tei Food Company Limited is an excellent example of how the application of local food goods, local expertise, and integrating package material (chemical consumer goods) produced in the region can be converted into a value added food product for regional and national demand. The company is located in the Daqing National High-Tech Industry Development Zone. The company has expanded operation to mid-level supermarkets throughout Heilongjiang, and through distributors, elsewhere in China. The firm purchases local packaging materials for its product, and about 15% of its staff is from the Heilongjiang Agricultural School.

  With a strong grain supply, as well as strong production of produce and livestock, the agricultural supply chain is very deep. The lack of a robust food processing industry compared to the rest of China means that a broader supply chain must develop to enable a wide diversity of consumer products to be manufactured, packaged, and marketed. The components of this supply chain are reasonably close at hand, for example, planned additional petrochemical supply from refineries needs to be extended to manufacture packaging materials; logistics constraints to move processed food goods needs to be studied and plans made to resolve; recognition of financing problems for incubator food processing businesses needs to be addressed.
- **Composition**: Daqing's value-added agriculture cluster is composed of commercial actors that are building on expertise in traditional agriculture to transition away from commodity based production and relevant economic foundation elements located in Daqing itself and throughout Heilongjiang Province.
- **Cluster**: Daqing's value-added agriculture, including commercial actors, is primarily engaged in Daqing's grain and livestock processing. For example, soy bean processors include the aforementioned Daqing Qing Ji Tei Food Company Limited, the Daqing Riyuexing Limited

[95] http://www.agrivision.ca/pdf/factsheets/bioproducts.pdf

Company which make soybean powder for food products, and the Daqing Sun Moon Star Protein Co., Ltd. which is, "the largest ISO9001 certified production base of isolated soy protein, defatted soy protein, protein powders in the world."[96] Dairy processing businesses include China Milk Products Group Limited which, "is the largest company specializing in the production of pedigree bull semen, pedigree dairy cow embryos and raw milk in the growing dairy industry in China" and boasts a herd of 150,412 pedigree bull sires, dairy cows and calves and 125 million square meters of grassland and 1.83 million square meters of farm land.[97]

The city also benefits from Heilongjiang Province's well-developed research and development capabilities and strong industrial base and Daqing's own economic foundation actors. These include the Daqing campus of the Heilongjiang Agricultural University Faculty of Food Science and the affiliated Food Processing Research Center, Northeast Agricultural University, the Harbin Department of Science and Technology of Heilongjiang Provincial Government and the Harbin Technology Park in Harbin. The Food Processing Research Center is particularly important for the development of value-added agricultural activities in Daqing. The Center was established under an MOU with the Alberta Ministry of Agriculture and the Heilongjiang Science Bureau. The Center conducts agricultural R&D in the areas of:

- Grain processing (corn, rice, soy) with a primary focus on starch production.
- Meat processing (separating elements from meat by-products) with a primary focus on processing value-added chemicals from pig intestines.
- Northern Herbal Medicine: with a primary focus on one the gold lotus flower and methods of extraction from that plant.

The Center transfers technology to local companies for sale by firms. Already, private companies are beginning to locate their R&D activities at the Center including the Daqing Dairy Plant.

In terms of support services, because of Daqing's long history with traditional agriculture, the agricultural supply chain for value-added activities is well-developed.

Daqing and Heilongjiang also have many of the economic foundation infrastructure elements in place to support the agriculture sector and keep it in alignment with the sector's future needs as it focuses more on value-added activities. Electricity and natural gas are widely available. Access to finance remains a concern, but some financial institutions such as the Daqing Commercial and Industrial Guarantee Company Daqing City Commercial Bank are perceived to be largely sensitive to the agriculture sector's distinctive financing requirements and business cycles. Heilongjiang is home to several leading institutions that are involved in applied agro-processing research and innovation and although the local August First Agriculture School is not seen as a good source of training for the agriculture sector, good training and qualified staff are widely available at Heilongjiang's other agriculture-related institutions. Finally, the regulatory environment is perceived to be largely supportive of the agriculture sector.

- **Challenges**: The successful development of the food service segment of the agriculture cluster will depend on addressing the issues which are impacting emerging companies in the sub-sector such as access to financing, logistics to enter other markets, etc., so that investors can see the region as a fertile investment opportunity. Another key challenge confronting

[96] http://www.alibaba.com/company/10892051.html
[97] http://www.chinamilkgroup.com/

Daqing is strengthening the capacity of local enterprises to develop products that are *market-driven*. This requires developing the capacity to identify markets in which Daqing has comparative or competitive advantages, be attentive to changes in consumer preferences, and to modify products to meet these changes in consumer preferences.

Industry 12: Bio-Fuels Cluster (Emerging)

- **National & Global Trends and Structure**: Research and technology development associated with the application of agricultural based products is growing at an accelerating rate in all areas of the world, including China. Much of the technology is rooted in the agricultural, energy and chemical industry clusters. ICF believes that the emerging development of bio-products business and integration with other primary clusters requires that the bio-industry be treated as a "seed" or early stage cluster. This potential cluster is one for which Daqing may have a number of advantages from feedstock to processing and support expertise.

  The growth in bio-fuels has centered on the conversion of agricultural feedstocks for fuel purposes. Brazil and the United States have led the world in the development and integration of ethanol as a fuel substitute for gasoline. Brazil uses ethanol produced from sugar cane; the United States uses ethanol produced from corn. Germany has become the global leader in the production of bio-diesel, produced from soy or rapeseed oils or animal fats and used as a supplement into fossil based diesel fuel.

  Although they required significant government intervention or subsidies in each country to foster development, these initial developments have proven commercially successful. They have led to significant research into other possible applications of bio-technology to produce fuels as well as chemicals that can further reduce oil dependence and improve the environment. The major global trends include:
  - **New Directions in Ethanol**: Ethanol products developed from cellulosic (bio-mass) sources rather than sugars or starches. These products produced from corn husks, rice straw, and switchgrass produce fuel from waste products and do not impact potential global food supply. The cost of cellulosic-based supply is currently higher than from sugar or starch, but extensive research is being done to reduce the cost of commercial cellulosic projects.
  - **Need for Next Generation Production Facilities**: There are no commercial cellulosic plants anywhere in the world (Zaodong has a pilot plant for corn stalk cellulosic conversion). In almost all cases, development of a "seed" cluster requires strong collaboration between the academic community, government, and industry. For instance, Logen (an Ottawa company that has developed Canadian bio-fuels technology) has been trying to build a plant in Iowa or Germany. However, these efforts have not been successful. As a result, Logen is now seeking money from the government of Alberta and Canada.
  - **Ethanol from Cellulose is a Priority**: The United States EPA is working with the Department of Energy to perform research to lower the cost to produce ethanol from cellulose by 2012. This is being done to improve the processes and cost of using cellulose for ethanol production, but the industry opportunities are still in the developmental stages.
  - **Other Bio-sources being evaluated**: India, in collaboration with BP, is developing projects to produce diesel fuel from Jatropha plants. In theory, the planting of Jatropha and the construction of small conversion plants could allow small villages to produce their own diesel fuel for power generation or heating needs locally.

- **Multiple Efforts in Place**: The Government of Ontario (Canada) is seeking diversification of core clusters through government, industry, and academic collaboration on bio-industry development.
- **China and HLJ have Strong Capabilities**: China and the province of Heilongjiang are highly involved in agricultural applications for bio-fuels. The largest ethanol plant in the world is located at Jilin near Heilongjiang. China's ethanol production is targeted to grow from 1 million tons in 2005 (under 2% of gasoline demand) to 15 million tons in 2020.98 Ethanol production in 2020 would represent about 20% of total gasoline demand, estimated at 74.9 million tons in 2020.99 This level of ethanol usage in China will require a significant integration with the existing oil infrastructure

Daqing Structure

While the ultimate focus of bio-fuels development is to produce goods that extend product output from the energy and chemical clusters, the expertise and supply chain associated with the development of the bio-fuels cluster can be significantly different from the conventional energy and chemicals industry. The clusters may only overlap around the actual blending interface associated with the product disposition to consumers (for example, the blending of ethanol into base gasoline at refineries or distribution centers, the blending of bio-diesel into fossil based diesel at distribution centers). An exception might be when a company is actively engaged in both clusters and perhaps shares some facilities in manufacturing the bio-fuels. In some cases, such as Jatropa and production of bio-chemicals, there is no "blending" interface with the existing cluster, and in fact, the products compete directly in the marketplace.

- **Composition**: The ICF interview process indicated the following attributes of the Daqing region's potential for bio-fuels cluster development:
  - **China Alcohol Resources Company (Heilongjiang)**: Located in Daqing, the China Alcohol Resources Company produces ethanol from corn grown in the region. The company supplies ethanol to CNPC outlets in the Heilongjiang region and their annual production of ethanol is 250,000 tons and expanding. This company is also collaborating with a Canadian company on a pilot project to produce ethanol from corn stalks using enzyme technology.
  - **Bio-Diesel from Soy**: The region has a project underway with an internal partnering soy processor to produce bio-diesel from soy oil.
  - **The National Grain Company**: This entity is producing cellulosic ethanol from corn stalks at a pilot plant adjacent to their ethanol facility in Zhaotong. That is a major achievement, even if in pilot stage.
  - **Small Presence of Bio-Based Products**: There is no significant evidence from interviews of the use of bio-based products to produce chemicals in the region.
- **Challenges:** Most nations with strong agricultural capacity are now actively developing bio-fuels. Daqing is particularly advantaged due to diversity of agricultural commodities produced, processing experience in other fields and strong potential demand for uses, as well as access to research capabilities at national universities related to these fields. While the overall depth and resources for this value chain are limited at this point, the potential for

98 *China Daily*, December 21, 2006, "Stricter rules on ethanol production."

99 World Energy Council, *China's Transport Prospects*, Yuanlong Chen, Aihua Piao and Zhaosheng Xiao, The Institute of Comprehensive Transportation State Planning Commission , Beijing, China, 2005.

growth is large. However, there are many challenges, which include issues of developing cost effective the cellulose based ethanol supply, distribution of ethanol, and ethanol blends outside the province, as well as exploring optimal bio-chemical production alternatives.

Despite China's massive need for alternative energy supply, coordination of the bio-industry cluster will be challenging. The optimum is to integrate it with the oil industry in Heilongjiang itself – which requires CNPC and national government cooperation in the areas of bio-fuels (ethanol and bio-diesel). The opportunities in the petrochemical sector may be more realizable as the linkage between the agriculture business and petrochemical derivatives may not require CNPC integration into the supply chain.

Industry 13: Metal Fabrication and Machinery Equipment

The high focus on the energy industry in the region requires an ongoing supply of primary support equipment. This includes compressors, pumps, piping, control valves, instrumentation (electronic, pneumatic, and optical).

The metal fabrication and machinery segments can be valuable parts of several clusters. They can also export to national markets if they gain strong advantages in Daqing.

- As the energy extraction sector grows to incorporate new supply sources such as natural gas, shale oil, and potential new refinery processes or projects to convert coal into gas or liquids, the support industry for this sector will also need to grow.
- Similar equipment is needed for the expansion of the chemical industry
- The bio-products industry cluster will also benefit. While some shared equipment and fabrication will be needed in the bio-products sector, the expertise (engineers and assembly processes) can migrate into the bio-industry itself.

Daqing Structure

- **Composition**: Although the Heavy Machinery industry is quite extensive in the region, interviews found that the region's production is not as competitive as the equipment manufactured overseas by international companies.
- **Challenges**: The challenges are twofold. One, the local industry must become more competitive with international suppliers like Siemens and others. Major projects from CNPC, for example, may be more likely to use reliable international suppliers unless local heavy industry is more competitive. Secondly, as the regional economy grows, it will be critical that the market become more integrated with practices that manage the level of energy usage. Businesses which develop market technology to minimize energy usage provide different equipment and machinery than would be required to process oil and coal. The range of weather conditions in HLJ, in particular the severe winters, have resulted in some companies' indicating that energy efficiency can be an issue in decisions on business location and profitability.

4. Assessment of Economic Input Advantages for Diversification

4.1. Economic Foundation Capacity

Cluster-based economic development only takes place when there are specific economic input advantages that lead to growth of the industry value-chain. The previous chapter examined the industry base from which production advantage for diversification of the Daqing economy could be developed. However, while provincial and municipal government programs designed to encourage the formation of new enterprise, expansion of existing enterprise or recruitment of international partners can be used, the success of those efforts will be substantially influenced by how well a range of specific economic input foundations support a new cluster through its development stages. This chapter examines the continuum of economic input advantages that Daqing has and provides a basis from which different resources to assist cluster development can be drawn. Not all economic inputs are well matched to existing or new clusters. Not all economic input foundations have the capacities or responsiveness required to aggressively assist enterprise formation, expansion, and attraction. However, Daqing is fortunate to have a strong platform of advantages on which it can build.

The ICF team reviewed the characteristics of the Daqing-city region's sources of economic inputs and identified target institutions that are key providers in the cluster diversification development process. The analyses focused on the strengths and weaknesses of the regions 11 categories of economic input foundations: innovation, land use, telecommunications, transportation/logistics, power supply, environment, financing, human resources, housing, social amenities, marketing, and governance. The analysis draws its findings from available quantitative indicators, as well as the interviews with local officials and the leaders/managers of institutions and agencies.

Table 5: Organizations in the Economic Foundations in Daqing City

Innovation	• *150,000 scientists and researchers* • *More than 100 research centers and 50 laboratories* • *6 provincial-level testing centers* • *7 universities* • *Daqing Petroleum Research Institute* • *Daqing Petroleum College* • *Daqing Petroleum Management Bureau R&D Centre* • *High Molecule Material R&D Center (Jointly funded by Daqing city government, Daqing Petroleum Research Institute, Daqing Petroleum College, and Russian scientists)* • *Fine-Petrochemical Research and Development Center (Jointly funded by Daqing Petroleum Research Institute, Heilongjiang Longwei Petro-Chemical Company, and Daqing Petroleum College)* • *Daqing Petroleum College* • *Daqing Medical School for Continuing Education*
Human Resources	• *Daqing Petroleum College* • *Daqing Petroleum College* • *Daqing Medical School for Continuing Education* • *August First Agriculture University*
Financing	• *Daqing Commercial and Industrial Guarantee Company (city-owned)* • *Daqing Commercial Bank* • *Heilongjiang S&T Department R&D and commercialization funds* • *Tech park financing*
Land Use	• *20 industrial and technology parks, including;* • *Daqing National High-Tech Industry Development Zone* • *Fine Petrochemical Products Park*
Telecommunications	• *Daqing Optical Fiber Networks*
Transportation/Logistics	• *Binzhou Railway* • *Rangtong Railway* • *More than 25 railway stations* • *Sui-Man Highway* • *Daqing Airport, to be completed in 2008*
Power Supply	• *Daqing Power Bureau and the Power Supply Company of the Petroleum Management Bureau*
Environment	• *95% of firms meet waste standards* • *High air quality*
Marketing	• *Propaganda and Promotion Department* • *Foreign Affairs Office* • *Ha-Da-Qi Corridor Office*
Governance	• *Daqing Commerce Department* • *Daqing Tax Department* • *Daqing Planning Department* • *Daqing Oil Field Administration*

4.2. Innovation

Innovation is the ability to discover, develop, and deploy knowledge in a form that impacts the local economy. Having research institutions in a municipality or broader region does not guarantee innovation. Research discoveries may easily diffuse globally unless there is local capacity to develop scientific applications into technologies and products. Further, technology developments may not benefit the local economy if companies are not able to adopt them or to produce and sell them to others. For this reason, every region has an innovation channel that is effectively and fully in place or not. In municipalities, such as Daqing, having an effective innovation channel is the key to certain aspects of diversification. Beyond oil and gas, this is particularly true in emerging clusters such as bio-fuels and value-added food processing.

The capacity to discover, develop, and deploy in certain areas of innovation is significant in Daqing—particularly in the petroleum industry. Moreover, Daqing can draw from an extensive

array of innovation resources throughout the province of Heilongjiang and the Ha-Da-Qi Corridor. The Corridor is anchored by 65 institutes of higher education and 125 research centers, including such strong entities as the Daqing Petroleum Institute, the Harbin Institute of Technology, and Harbin Institute of Engineering—all of which rank among the best in China.

Yet even with these assets, Daqing needs to improve the entrepreneurial culture needed to successfully develop and deploy innovation across industries other than oil and gas. Most research centers are still oriented toward oil and gas and produce few new "innovation-driven" enterprises. R&D has been most successful for petroleum and other main user industries. There have been few value-added businesses, new exports generated, or private and joint-venture enterprises. The research centers are generally not oriented towards technology commercialization and spin-offs. There is a possibility that the creation of the high-tech zone will attract and foster a higher level on entrepreneurial activity in the region. However, this remains to be seen.

New provincial and municipal incentives represent positive areas of improvement in financing in Daqing. The Heilongjiang Science and Technology Department sponsors commercialization at 160 million yuan, and another 100 million yuan for high-tech R&D.[100] The City-owned Daqing Commercial and Industrial Guarantee Company guarantees debt up to 40 million yuan, but these investments are frequently reserved for larger, later-stage, high-tech companies.[101] High-tech parks are playing an increasingly important role in helping their tenants fund R&D, obtain capital, and reduce start-up costs in other ways (e.g., with incubators), at all stages of development. The key challenge is to build stronger organizational linkages between research centers, company development operations, and new producers and suppliers. Daqing needs an innovation pipeline that will serve its existing as well as emerging diversification opportunities.

4.2.1. Strengths

- **High level of innovation in the petroleum industry (upstream)**: The petroleum industry is frequently cited as Heilongjiang's industry with the best level of innovation—and Daqing is at the center of that. Daqing has over 150,000 scientists and researchers in over 100 research centers, including 6 provincial level testing centers and more than 50 laboratories. About 60 percent of this research is estimated to be in the petroleum industry. The research is mostly applied research and technical testing. (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).
- **Major innovation results in petroleum and petro-chemicals**: Since 2000, the petroleum and petro-chemical industry has achieved 21 provincial-level R&D results and has developed 135 new technologies.
- **Innovation concentrated in CNPC R&D centers**: The CNPC Daqing subsidiary companies have 15 R&D centers (and more than 50,000 researcher and scientists), e.g., Petroleum Academy, Petro-Chemical Engineering Research Institute, Daqing Petroleum Normal College, Daqing Medical School for Continuing Education, and the Drilling Research Institute for Natural Gas (Interview, CNPC).

[100] Interview, Department of Science and Technology of Heilongjiang.

[101] Interview, Daqing National High-Tech Industry Development Zone, Heilongjiang Dafeng Agriculture Technology Co. Ltd.

- **Strong university-industry linkages, particularly in applied research**: The Municipality of Daqing and the Science Bureau have encouraged strong linkages between industry and research centers. Applied research is a strength; each one of the 100 research centers in Daqing is affiliated with a university; Daqing has seven universities. The Daqing Petroleum College works closely with Daqing PetroChina companies in R&D, particularly applied research (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).
- **New R&D centers (primarily petroleum-related) emerging from university-industry linkages**: Universities and corporations are creating new linkages in order to share the costs and benefits of R&D.
  - **High Molecule Material Technology R&D Center**: A product of a joint investment by Daqing city government, Petroleum Research Institute, Daqing Petroleum College, and Russian scientists. (Interview, Petroleum Research Institute and Heilongjiang Longwei Petro-Chemical Company).
  - **Fine-Petrochemical Research and Development Center**: A product of joint investment by Petroleum Research Institute, Heilongjiang Longwei Petro-Chemical Company, and the Petro-Chemical School of Daqing Petroleum College. The university provides the infrastructure and the partners all share staff for R&D. The institute pays professors to do research and owns the intellectual property. The company performs commercialization (Interview #29, Petroleum Research Institute and Heilongjiang Longwei Petro-Chemical Company).
- **Daqing also home to R&D in manufacturing and agriculture**: Beyond petroleum, other R&D in Daqing mainly supports mechanical manufacturing and agriculture (specifically dairy). (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).
- **Daqing is home to nationally-designated high-tech park**: The Daqing National High-Tech Industry Development Zone is designated a "National Level High Tech Development Zone," of which there are 54 so designated in China.
- **Rubber Park has high concentration of plastics research in Daqing**: There are thousands of plastics researchers in Daqing, many of whom are at the Honggang Rubber Park, founded in 2004 and home to 12 companies in tire recovery and recycling. One company in the park is commercializing a sapphire chip product (with uses in defense, auto, and photocopiers) with Heilongjiang Institute of Technology and a Shanghai research institute (Honggang Rubber Park).

4.2.2. Weaknesses

- **R&D activities are involved with applied research, less with commercialization**: Most R&D, even in oil and gas, is focused on applied research, and less on commercialization, and few new innovation-driven enterprises, value-added businesses, exports, or private and joint-venture enterprises are created.
- **Research in downstream petroleum activities is undeveloped**: Despite its strength in petroleum upstream activities, Daqing has not developed much competitive strength in petroleum downstream activities, R&D included.
- **Lack of a strong entrepreneurial culture**: Daqing and the rest of the Corridor lack a strong entrepreneurial culture to achieve "technology capture," or the deployment of innovation in the local economy to start up new companies and diversify the region's existing industry portfolio.
- **Research is sometimes reactive, especially within CNPC**: Research in Daqing can sometimes be reactive. Daqing's CNPC subsidiaries do not have any autonomy in their R&D

directions—they receive orders from the Daqing Petroleum Management Bureau (the arm of Daqing CNPC that supports the Daqing Oil Field Company).

- **Capacities for innovation in high-growth potential industries are underdeveloped**: There are seeds of potential for soy innovation in the Corridor, yet most innovation activity still focuses on value-added food, and not yet chemical feedstocks and value-added chemicals.
- **Daqing produces S&T organizations than Harbin and other Chinese cities**: As seen in the table below, though Daqing has the highest total revenue in S&T activities of all cities on the Corridor, it still has fewer S&T organizations than Harbin (and other Chinese cities). This is likely due to most of its S&T activity tied to CNPC subsidiaries; its revenues are not producing as many new spin-off S&T organizations as elsewhere in China.

Table 6: Indicators of Innovation in 3 Cities on the Ha-Da-Qi Corridor

	Daqing	Harbin	Qiqihar
Number of S&T Organizations	68	131	33
Number of Persons in Large- and Medium-Sized S&T Enterprises	25,974	17,127	9,238
Total Revenue in S&T Activities (10,000 yuan)	1,491,828	95,105	67,433

Source: 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar

4.3. Human Resources

Human resources are a central asset required to diversify and grow the economy. The need for different levels of skills across multiple occupations and professions requires a strong and dynamic human resources input foundation. Workers at professional levels will tend to be attracted to municipalities and regions that have education and training institutions that are able to adapt to changing market demands. These are very important assets in the human resource supply chain. There are three levels of human resource development that competitive regions need to strengthen for dynamic economic growth—preparation, advancement and renewal.

Preparation is delivered by the primary and secondary school system as well as basic vocational institutions. In addition to preparing graduates to meet regional workforce skill needs, these institutions need to anticipate longer-term needs for basic education and collaborate with industry to meet them.

Advancement is where municipalities and regions often develop more specialized institutional capabilities that are synchronized with the surrounding economy. Colleges, specialized vocational and technical institutes and universities can and should learn the skill needs of industries and assess skill demands for two and four years ahead on a continuing basis. While recruiting workers with needed skills is always necessary, regions that have achieved development of full clusters often recruit workers from one another, leading to lateral workforce movement (and transfer of skills to competing firms).

The maintenance of skilled workforce is a major challenge for all employers. For this reason, larger employers often establish internal "universities," affiliated with specialized training centers to help upgrade workforce skills and hire training experts from the outside. With software skills obsolescence now occurring in less than 18 months and electronic engineering in less than 2.5 years, high performing economies have carefully organized retraining programs for all workers. Furthermore, among older workers, retraining may be a crucial means of preserving needed skills as well as maintaining current capabilities.

No economy can diversify easily without having educational and training schools and institutions directly involved as partners in building the needed next generation workforce. The good news for a municipality such as Daqing is that it can draw from the human resource capabilities of the entire corridor. However, that also means that other municipalities and their industries may also be competing for the same skill base.

Human resources are one of the biggest challenges facing Daqing and the Ha-Da-Qi Corridor, probably second in magnitude and immediacy to transportation/logistics. The Corridor has 65 institutions of higher learning and 40 common universities, but attracting and retaining a young, high-skilled workforce to northeast China is the root of the Corridor's human resources challenge. The Corridor has a historically talented workforce in oil and gas, and offers businesses a relatively cheap low-to-mid-skilled workforce, but retaining its high-skilled graduates in other fields is a persistent problem. Quality of life and lower wages in some industries, compounded by regional image problems, all challenge the Corridor's ability to compete with the coastal regions of China for young professionals. As a result, companies in the Corridor are forced to recruit from outside the province for employees with such professional skills as information technology, management, marketing, law, and communications.
Heilongjiang Province and some of the Corridor cities have policies that emphasize harnessing the Corridor's educational institutions, such as efforts to intensify cooperation on the Corridor between government agencies and the Corridor's universities, but the Ha-Da-Qi Corridor, and all of the cities within the Corridor, including the Daqing-city region, needs a coordinated network of national, provincial, and municipal agencies, educational institutions, and industrial representatives that work together to ensure a smooth system to prepare, advance, and renew the workforce with the skills they needs to feed the Corridor's existing and emerging cluster industries.

In Daqing and the Ha-Da-Qi Corridor region, a well-performing Skills Pipeline exists for the oil and gas and agriculture clusters, and to a lesser extent the heavy equipment cluster, but the Corridor lacks the Skills Pipeline to support its other existing and emerging clusters. The Corridor must ensure that its Skills Pipeline is strong at each segment of the workforce's education continuum, and that it successfully feeds the needs of its cluster portfolio. This means not simply offering business access to the existing workforce, but improving existing educational institutions and even considering creating entirely new programs, and possibly even new universities and colleges, which focus on the needs of the Corridor's targeted clusters.

4.3.1. Strengths

- **Daqing is home to some of the best skills in China in the petroleum, petro-chemical, and agriculture industries**: Daqing, home to China's largest oil field, has some of the best technical skills in the industry, with 50,000 scientists at such universities as Daqing Petroleum College and Heilongjiang August First Land Reclamation University (Interview source: #22, Daqing National High-Tech Industry Development Zone – Economic and Technology Development Bureau).
- **Daqing has attracted two new major universities**: In the past few years, Daqing has successfully attracted Daqing Petroleum Institute and August First Agriculture University from other Heilongjiang cities. The city has also attracted other Heilongjiang universities to establish branches in the city.

- **Daqing's population has higher-than-average education**: As seen in the table below, it is estimated that 19.3 percent of Daqing's employees are university-educated. This is one percentage point higher than the 120-city average of 18.3 percent ("World Bank Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China").

Table 7: Indicators of Human Resources in Daqing

Percentage of Workers with University Education	*19*
Number of Institutions of Higher Education	*4*

Sources: 2006 Statistical Year Book for Daqing and "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006.

- **Daqing spends far more on education than other Chinese cities**: Daqing spends 757 rmb per capita on education, roughly equivalent to Harbin but much higher than the Northeast China city average of 425 yuan, and higher than the average in most other developed regions of China (e.g., Bohai: 593 yuan, Southeast: 715 yuan). ("World Bank Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China").
- **The city is advertising the Daqing National High-Tech Industry Development Zone to get expatriates to return to Daqing**: The Daqing Municipal Foreign Affairs Office is using the Daqing National High-Tech Industry Development Zone as a platform and plans to attract 20,000 professionals who are originally from Daqing to return to Daqing to start businesses. To date, the program has resulted in approximately 70 former Daqing residents returning to develop 40 new enterprises in the Park (Interview source: Daqing City Foreign Affairs Office).

4.3.2. Weaknesses

- **Although Daqing offers a competitive low-to-medium-skilled labor force, it needs to grow its high-skilled labor force**: Companies cite Daqing's abundant and relatively cheap supply of low-to-medium-skilled employees as a competitive advantage, but the city must grow its high-skilled labor force in order to compete in high-skilled industries, which offer the best opportunities for better quality of life returns for Daqing's residents.
- **Lower-than-average wages are a challenge to attracting and retaining a high-skilled labor force**: Daqing has 145,000-employee professional/technical labor force, but because of below-average wages—the average wage is 53,000 rmb—Daqing has difficulty attracting and retaining a high-skilled labor force in industries other than petroleum (Source: Daqing Mayor's Office).
- **Quality of life is a challenge in attracting and retaining a high-skilled labor force**: Even when companies in Daqing offer the same wages as the coastal regions, Daqing does not compete well in attracting workforce due to its lower quality of life (Interview source: #15, Hua Jian Software Company).
- **Graduates of Daqing universities are being lost to jobs in the coastal region**: Many of Daqing's university graduates are lost to job opportunities in the coastal regions that are more developed and offer higher quality of life.
- **Daqing universities lack professional management programs**: Daqing's universities have a shortage of professional programs that prepare students with skills in management, marketing, law, and communications. Daqing has several business schools but young graduates lack relevant experience and companies frequently recruit management talent from outside Daqing.

- **Companies in industries other than oil and gas and agriculture must seek partnership with universities outside the Corridor**: Because most of the Corridor's universities focus on petroleum, petrochemicals, or agriculture, other industries are forced elsewhere for university partnerships. Huatai Company jointly developed its sapphire foundation chips with the China Academy of Science (in Beijing) and worked on additives research with Xufu University (in Shangdong province) and Fudang University (in Shanghai) (Interview #23, Daqing National High-Tech Industry Development Zone, Overseas Park, Huatai Company).
- **Companies are forced to recruit high-skilled technical and management employees from the coastal regions**: Companies that were interviewed repeatedly cited the challenge of finding high-skilled technical and managerial employees in Daqing, even when offering salaries equivalent to those of the coastal regions.
- **Workforce quality is a threat to Daqing's business image**: Forbes magazine ranked Daqing the ninth best Chinese city to establish a factory in, but only 64th best in quality of the workforce. This kind of ranking threatens to hurt Daqing's image for attracting future investment.

4.4. Finance

Finance is a crucial economic input to development and diversification of the municipal and surrounding regional economy. A healthy economy has three forms of financing that flow into the development stages of enterprise—capital for initiation, expansion, and modernization or restructuring. Capital for initiation is crucial for new growth. Metropolitan regions that have a dynamic economy have diverse sources of capital for the earlier, higher risk, stages of development. This is called pre-seed and seed capital. Such capital typically comes from government programs as grants or contracts for development that creates cash needed for "proof of concept" and pilot-testing of an innovation. But just as often such capital comes from family, friends and what are now known as "angels" or groups of individuals with high net worth that can commit a pool of modest amounts of capital to a number of early stage enterprises.

Once past the start-up stage companies typically need capital for scaling up production and sales. This calls for another form of risk capital, which may be venture capital which provides a flow of cash in exchange for equity. Many companies go through multiple rounds of venture capital, diluting their equity at each stage. There are now thousands of venture funds and private equity funds globally. Provinces and municipalities sometimes place capital in private funds to energize enterprise formation. What is crucial for municipalities and regions that do not have venture capital and private equity funds is to focus on generating high quality candidate deals for investors to consider. Economies that generate higher volumes of well prepared and well screened deals are then able to either attract investors or go to them with stronger offerings.

As businesses begin to generate revenue they begin to utilize traditional lines of credit and asset-based loans. As they mature and require restructuring, they may require special loans, based on debt that can be converted into equity in the firm or investment banking services to facilitate mergers or acquisitions. A high performing economy has an entire continuum of capital accessible to firms. In turn, this capital attracts more firms, because they know that they can obtain needed capital.

Lack of finance is frequently cited as a threat to growth of firms in Daqing and along the Ha-Da-Qi Corridor. Most companies interviewed—with the exception of CNPC subsidiaries and a few

large, foreign, joint-venture enterprises—cite financing as a main obstacle to business development and expansion.

According to a World Bank report, the percentage of small- and medium-sized private enterprises (SMEs) with bank loans is several times lower in the Ha-Da-Qi Corridor than elsewhere in China, and Corridor cities have fewer SMEs as a result ("Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China").

At the seed capital phase of financing, companies along the Corridor frequently rely on friends and family, although provincial funds, municipal governments, and tech parks also play a role. The Science and Technology Department of Heilongjiang sponsors commercialization at 160 million yuan, and another 100 million yuan for high-tech R&D (Interview, Department of Science and Technology of Heilongjiang). Municipal governments and their economic or science and technology commissions also provide some initiation capital for SMEs. And increasingly, high-tech parks have been playing an important role in helping their tenants fund R&D, obtain capital, and reduce start-up costs in other ways (e.g., with incubators).
Securing financing at the expansion and maturation stages is far more difficult along the Corridor. Commercial banks are few in number along the Corridor, and those that exist are not very active and frequently seek projects with fixed assets, such as land. In larger projects such as petrochemicals, CNPC is the main financial partner but only where they have an interest. Companies along the Corridor are in particular need of help in going public in stock exchanges (e.g., Singapore).

The Heilongjiang Provincial Government has recognized the strong need for financial institutions serving the Ha-Da-Qi Corridor. The government has recognized a need to both encourage financial institutions to set up branches along the Corridor, *and* directly provide financing itself. The form that this direct government financing will take has not yet been decided, but could include government financing of infrastructure, preferential bank loan rates, and/or direct investment or co-investment with city and county governments This will be the focus of the 11th 5-Year Plan (2006-2010). (Interview #2, HDQ Corridor Office).

4.4.1. Strengths

- **City government financing available to mostly large, high-tech companies**: The city-owned Daqing Commercial and Industrial Guarantee Company guarantees debt up to 40 million yuan.
- **Daqing Commercial Bank finances companies that help city development**: The Daqing Commercial Bank provides commercial loans to companies in food processing, real estate, petrochemicals, and manufacturing. The Bank targets financing toward companies that help city development, e.g., recent loans to companies that make ethanol from corn and process soy.
- **Tech parks provide funding**: Many parks provide funding at different stages of corporate development. It is common for companies to get some funding through the tech parks (Interview source: #23: Daqing National High-Tech Industry Development Zone, Overseas Park, Huatai Company).
- **Daqing is committed to increasing its financial services capabilities**: Daqing intends to support development of investment companies and guarantee agencies, and aggressively attract domestic financial insurance agencies and develop a full-range of financial services (Source: Daqing Assessment of Local Industry Structure).

4.4.2. Weaknesses

- **Financing is a persistent challenge**: A lack of financing is a frequently-cited bottleneck for several companies in the Ha-Da-Qi Corridor (Interview source: #24, Daqing National High-Tech Industry Development Zone, Daqing Qing Ji Te Food Company Limited).
- **SMEs have particular trouble getting financing in Daqing**: Small-to-medium-sized enterprises in the Ha-Da-Qi corridor cities—and Daqing in particular—have trouble getting bank loans; these cities also usually have fewer SMEs. Chongqing, which has a much higher percentage of SMEs with bank loans, might prove to be an example for Harbin, Daqing, and Qiqihar ("Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China").

Table 8: Private SMEs with Bank Loans: Ha-Da-Qi Cities vs. Other Cities

City	*Percentage of Private SMEs with Bank Loans*
Chongqing	*58.8*
Shenyang	*52.6*
Qiqihar	*32.4*
Harbin	*6.9*
Dalian	*0*
Daqing	***0***

Source: "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006.

- **Financing for incubator projects is limited:** Interviews indicated that the ability to initiate and develop a new business opportunity can be difficult in Daqing and the region. Improvement in this area is critical to enabling a strong innovative culture.
- **Daqing lags behind Harbin in municipal investments in innovation enterprises**: As seen in the table below, despite having higher total expenditures in S&T activities, Daqing has lower municipal expenditures than Harbin in innovation enterprises. Correlated is the fact that Daqing has fewer private SMEs with bank loans than Harbin does.

Table 9: Indicators of Finance in 3 Cities on the Ha-Da-Qi Corridor

	Daqing	Harbin	Qiqihar
Percentage of Private SMEs with Bank Loans	0	7	32
Municipal Expenditure for Innovation Enterprises (10,000 yuan)	73,115	152,961	4,683
Total Expenditure in S&T Activities (10,000 yuan)	1,322,351	155,255	61,071

Sources: 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar; and "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006.

- **It is hardest to get R&D and start-up financing**: Daqing city investment companies may only have small amounts to invest, around 2-3 million rmb, and most city investments go to the larger, more established companies (Interview #26, Daqing National High-Tech Industry Development Zone, Heilongjiang Dafeng Agriculture Technology Co. Ltd).
- **Companies also need help identifying and marketing to multi-national investors**: Daqing's companies need help identifying and marketing to not only Chinese investors, but also multi-national investors. This is a frequently-cited marketing/financing challenge by the growing/mature companies along the Ha-Da-Qi Corridor. (Interview source: #26, Daqing National High-Tech Industry Development Zone, Heilongjiang Dafeng Agriculture Technology Co. Ltd).

- **There is a need for professional services**: The Corridor companies are in need of a better offering of professional services, including insurance, logistics, information consulting, accounting, law, patents, and auditing (Source: Daqing Assessment of Local Industry Structure).

4.5. Land Use

Land is a distinctive economic input foundation and is crucial in growing industries that require space, but particularly when that space is close to another needed economic input, whether it be a natural resource, such as oil or agriculture; specific physical infrastructure, such as transportation and logistics; human resources, such as workforce skills; innovation, such as centers of research and development, and, of course, customers, or intermediaries or end-users. The most effective land assets are not necessarily large or low cost, but optimize access to inputs needed by the tenant. Today, the value of land can be increased through enhancement of the site by improving all inputs from the physical (water, roads, power, and structures) to actually bringing key institutions to the site, such as key suppliers or business partners, training, R&D organizations, logistics services, housing and amenities, such as hotels, retail, and entertainment. Today, raw land is less valuable than industry or technology parks that offer a "micro-economic environment" that delivers critical advantages to the industry tenants.

Land is an asset in Daqing and in the Ha-Da-Qi Corridor. There is an abundance of unused, relatively low-cost land along the Ha-Da-Qi Corridor, rich in saline or alkali (General Program on the Industrial Layout of Ha-Da-Qi Industrial Corridor, 44). There are many industrial and tech parks, particularly in Daqing, that offer a range of government-supported incentives to encourage industrial development.

Despite the great asset of land along the Corridor, Daqing faces the challenges of using urban planning and creative land assembly and development policies (coordinating among public and private partners) to encourage "smart growth" that protects the forest and other natural resources of the region. There is the risk that in the rush to show growth on "paper' Daqing, and other municipalities might use incentives to attract industries that are not necessarily ready to grow or are not synergistic with existing emerging clusters in the area. The danger is that there may arise industry and technology parks with empty buildings rather than growth from natural demand. There is need for caution and carefully managed collaborative processes to ensure that land is developed in a manner that integrates well with strategic economic directions in Daqing.

4.5.1. Strengths

- **Cheap industrial land**: Industrial land in Daqing is considerably more affordable than many other southern cities (Daqing Assessment of Local Industry Structure). Prices generally vary from around 60 yuan/m^2 (in Dumeng and Linxun) to 168 yuan/m^2 (in Honggang, Longfeng, and Ranghulu).
- **Home to 20 industrial parks, including nationally-designated high-tech park**: This number does not include facilities for petrochemical industries. The largest industrial park is the National High Tech Park (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).
- **Industrial parks meet company's basic needs**: Companies in Daqing's industrial parks cite the city's good provision of basic infrastructure to manufacturing plants inside the industrial parks, including roads, basic utilities, and special energy needs. It is a positive indicator that Daqing has a high number of enterprises and revenues in its tech parks, as seen in the table below.

Table 10: Indicators of Land Use in Daqing

Number of Enterprises in High Tech Parks	*1,520*
Total Revenue of all Enterprises in High Tech Parks (100 million yuan)	*430*

Source: 2006 Statistical Year Book for Daqing

- **Incentives to companies in high-tech parks encourage industrial development**: Daqing's tech parks offer incentives to companies that enter the parks with such government agencies as the Ministry of Science and Technology. Incentives include grants for construction, free land, start-up capital, incubation services, lab space, and other on-site services such as banks and supermarkets. These incentives serve to encourage industrial development.
  - **Fine Petrochemical Industrial Park is the result of cooperation between the local government and local enterprises**: The 4-square-kilometer park was originally developed in 2003 for CNPC. At the early construction stage, companies in the park benefit from free use of land, grants of 500,000 RMB for construction, and use of raw materials and services from the adjacent CNPC plant. The municipality of Daqing built the facility and attracted companies to the park. By the end of 2005, the park had more than 50 manufacturers and should reach full capacity soon (100). (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).
  - **Competing with Daqing's land use are its rich agricultural resources**: Daqing's plentiful natural resources make it competitive in the agriculture of corn, peanuts beans, and other products (Interview, Daqing National High-Tech Industry Development Zone, Daqing Qingte Food Company Limited).

4.5.2. Weaknesses

Daqing needs to invest in urban planning concepts: Due to the historical development of the city, Daqing's urban design and spatial planning has suffered. Daqing and the rest of the Ha-Da-Qi Corridor faces the challenges of using urban planning and creative land assembly and development policies (particularly through the coordination of public and private partners) to encourage smart growth—especially infill of the city's core—while designating certain Corridor areas as economic zones and protecting other areas as open space, forests, and other natural resources of the province. New economic zones (containing industrial estates and high-tech zones ranging from the national, to district, to county levels) have been developed in great numbers on greenfields along the Corridor—frequently duplicating the facilities and services of nearby zones and parks—while brownfields in the cities' cores have been ignored.[102] The Corridor must coordinate the development of fewer, higher quality, carefully-located economic zones and tech parks, possibly around infill sites. The Corridor may also consider the consolidation of existing economic zones in order to create higher quality offerings.

4.6. Governance and Business Climate

Governance pertains to how a government uses its powers to create a positive business climate for each industry. Separately from all the advantages that a municipality or province can deliver in the economic input foundations discussed in this chapter, governance policies pertain to taxation, regulation, and administration. Specifically, governance is about how well governmental powers are used. In this analysis the governance focus is on how *municipal* policies and practices affect the formation, retention, and attraction of business in the Daqing-city region.

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[102] Webster, Douglas, and Cai, Jianming, *Harbin's Future: Notes and Urban Planning Possibilities*, March 24, 2007.

One form of governance is taxation. The focus of most provincial and municipal economic development programs is on reducing taxes for industry clients. Yet, in analyzing high performing regions, tax rates per employee are not low. However, when measured in terms of benefits provided per tax dollar spent, the "return on taxation" is often quite high. Moreover, while firms that are seeking a new site often play one municipality against the other to compete on providing tax exceptions or holidays, they often turn around later and demand more infrastructure and services that require raising taxes. The reality is while tax rates are always a variable in company decision-making, municipalities that can demonstrate a "higher return on taxation" can often find companies more ready to seriously consider choosing their sites.

A second form of governance is regulation. Here, most provincial and municipal governments often compete against others by attempting to eliminate or reduce regulation. The major companies, however, are usually less concerned about eliminating the need to comply with regulations than they are of having consistent and efficient regulatory procedures that minimize time and associated compliance costs. For this reason municipalities (and technology parks) world wide are introducing one-stop-permit services to assist in company site location and launch of operations. However, leading municipalities are now examining how they can also assist in streamlining or making more efficient other regulatory processes, from harmonizing local building permits with neighboring jurisdictions and putting processing steps on-line to coordinating compliance with provincial environmental regulations.

A third form of governance is administrative practices. Here the focus is on ensuring that al governmental agencies that have interactions with industry adopt a "customer focused," "quality oriented" service style—from permit agencies to courts of law. In fact, municipalities in leading regions now carryout customer satisfaction studies and behave much like companies who depend on client satisfaction to retain their patronage.

Developing a positive approach to governance has many benefits. Not only is clarifying and improving how all government policies, program and practices impact upon industries important to retaining the industry base, it is also essential to building municipal and provincial brand nationally and globally.

The City of Daqing offers several advantages for a positive business climate. Daqing offers direct financial incentives for industrial development, particularly to businesses in the tech parks. In Daqing, incentives include tax "holidays" on corporate taxes, reduced VAT taxes on machinery, and associated inducements, such as low interest rates on loans, free land or factory space, plus funding for R&D. Daqing also offers one-stop shop facilities to speed permitting and administrative practices that are generally reviewed as responsive and customer-focused by businesses that we interviewed.

In spite of these advantages, there are still challenges to business confidence in Daqing. In particular, Daqing businesses have limited confidence in their local courts: Survey data indicate that all along the Ha-Da-Qi Corridor firms have a lower confidence in their local courts than do

firms in other parts of China—and nowhere is confidence lower than in Daqing. In Daqing, only 37 percent of businesses express confidence in their local courts.[103]

4.6.1. Strengths

- **Daqing's offers the most competitive financial incentives for development of the Corridor cities**: Daqing offers incentives for large, high-tech projects with good market potential. Incentives include reduced loan rates, free factory space or land, and R&D funding. As seen in the table below, Daqing has a higher tax revenue base than Harbin and Qiqihar that allows it to use financial incentives to develop targeted projects.

Table 11: Indicators of Governance in 3 Cities on the Ha-Da-Qi Corridor

	Daqing	Harbin	*Qiqihar*
Total Revenue of Local Government (10,000 yuan)	499,802	980,370	342,075
Total Expenditure of Local Government (10,000 yuan)	688,479	1,645,709	495,123

Sources: 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar; and "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006.

- **"One-stop shops" speed Daqing's business permitting process**: Daqing has established many one-stop business registration centers to assist with business registration. Companies in Daqing that were interviewed give Daqing favorable ratings on the ease of obtaining business permits and the city's willingness to provide assistance.
- **Business permitting is quicker in Daqing than elsewhere in China and elsewhere on the Corridor**: As seen in the table below, survey results show that businesses in Daqing have to spend far less time with government agencies than do businesses in Qiqihar and Harbin (Source: "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006").

Table 12: Efficiency of Governance in Daqing vs. Other Chinese Cities

City	*Days per Year of Interaction with Four Major Government Agencies*
Daqing	***49.0***
Shenyang	*58.9*
Chongqing	*74.4*
Harbin	*79.5*
Qiqihar	*87.8*
Dalian	*91.4*

Sources: "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006.

- **Permitting is quickest in the tech parks**: Many of Daqing's tech parks have a one-stop shop, with representatives from the city's commerce, tax, and planning departments, where a company can finish all of its business permits and processes. In the Daqing National-Level High Tech Park, a business can reportedly finish all of its permits and procedures in one week (Interview, Daqing Baiautai Technology Company Limited).
- **Daqing has the fastest customs clearance on the Corridor**: As seen in the table below, Daqing has by far the quickest customs clearance (8.1 days on average) of any of the other

[103] "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006.

cities on the Corridor. It is competitive with the rest of China as well (Source: "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006").

Table 13: Speed of Customs Clearance in Daqing vs. Other Chinese Cities

City	*Average Number of Days Needed in Customs to Complete an Import-Export Cycle*
Dalian	*6.7*
Daqing	***8.1***
Chongqing	*10.8*
Qiqihar	*12.6*
Shenyang	*16.5*
Harbin	*18.7*

Sources: "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006.

4.6.2. Weaknesses

- **The City of Daqing has fewer resources than two CNPC administrative bodies**: The City of Daqing administration has fewer resources than the two CNPC administrative bodies:
  - **Daqing Oil Field Administration**: The administrative group that supplies the social infrastructure for the oil and gas workers in Daqing; and
  - **Daqing Oilfield Ltd. Company**: The subsidiary of CNPC that is responsible for all exploration and production of oil and gas in Daqing, is reportedly the largest taxpayer to the Chinese government, and provides a portion of the social infrastructure within the city limits of Daqing.
- **Confidence in Daqing's tax structure is low and may need examination and/or amendment**: Currently, all taxes paid by CNPC go directly to the central government, and less than 11% of these tax revenues are transferred back to the municipality of Daqing. The result is a lower tax base in Daqing than it might otherwise have, and city infrastructure may be affected. The tax structure should be examined to consider increasing the share that stays in Daqing (Interview, Secretary General of the Financial and Economic Leading Group of Heilongjiang Province).
- **The city needs to expand its base of non-CNPC-owned companies**: Because the Daqing tax structure sends most tax revenues collected from CNPC straight to the federal government, the city has a low tax base and needs to resolve this with a commitment to developing non-CNPC companies (Interview, Secretary General of the Financial and Economic Leading Group of Heilongjiang Province).
- **Daqing needs to consider a resource consumption tax**: Daqing is overdue to perform an analysis considering the implementation of a resource consumption fee that would collect taxes for resource depletion (e.g., in oil fields). A similar policy has already been incorporated into the NDRC NE China Revitalization Plan. Daqing is in particular need to consider such a policy, because it has the lowest tax collection of all oil fields in China. CNPC opposition has slowed this analysis from taking place (Interview source: Secretary General of the Financial and Economic Leading Group of Heilongjiang Province).
- **Daqing businesses have low level of confidence in their local courts**: As seen in the table below, survey data indicate that firms in the Ha-Da-Qi Corridor have lower confidence in their local courts than do firms in other parts of China—and nowhere is confidence lower than

in Daqing. In Daqing, only 37 percent of businesses express confidence in their local courts. See table below.

Table 14: Businesses' Expectations of Legal Protection in Daqing vs. Other Chinese Cities

City	*Percentage of Businesses that Expect Court Protection for Legitimate Contract or Property Rights*
Chongqing	*71*
Dalian	*65*
Shenyang	*54*
Qiqihar	*54*
Harbin	*50*
Daqing	***37***

Sources: "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006; *ADB report; World Bank transport report; and staff estimates.*

- **Taxes and fees are higher in Daqing (and the rest of the Corridor) than elsewhere in China (as a percentage of value-added)**: As seen in the table below, survey results show that taxes and administrative fees (as a percentage firms' value-added) are higher among firms in Harbin, Qiqihar, and Daqing than firms in Chongqing, Shenyang, and particularly Dalian. These locally-imposed fees are usually related to land use, construction, road transport, and business registrations ("Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006").

Table 15: Taxes and Administrative Fees in Daqing vs. Other Chinese Cities

City	*Taxes and Administrative Fees as a Percentage of Value-Added*
Daqing	***5.3***
Qiqihar	*5.2*
Harbin	*5.2*
Chongqing	*5.1*
Shenyang	*4.6*
Dalian	*3.1*

Sources: "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006.

4.7. Transportation and Logistics

Transportation and logistical capacity is essential to virtually every industry cluster, although varying in need and form. There are three major categories of transportation and logistics capacity for which a municipality or region should have a strong integrated capacity:

- **Channels**: Every municipality or region needs a diversity of channels through which it can deliver goods to its customers. Each channel needs capacity to serve its local producers. Locations without adequate access to end markets, typically measured in carrying capacity and time to deliver to end customer, will not be able to attract clients. For this reason, high performing economies are able to provide prospective companies with detailed information on their system of roads and highways; their airports and destinations served; their rail lines and their carrying capacity; their river or seaports and their access to other ports, and; range of pipelines and markets reached.

- **Multi-modal transaction hubs**: In industries that need to produce and ship varying size deliveries to multiple destinations, there is now a rising need for facilities that enable multi-modal movement of goods. For example, from ship to rail or truck, from train to truck, from truck to airplane, and so on. As a result, municipalities and their surrounding regions need to be able to plan for and operate a variety of hubs that can manage shipments—these are often privately managed on public land, but take many forms. Increasingly new multi-modal logistical hubs are being established at airports, seaports and rail yards, each being expanded to accommodate trucks, planes, trains, or ship entry, loading and unloading, in an efficient manner, with automated warehousing as well as intermediate or final assembly of products whose components have been delivered from different sources. Multi-modal hubs are now becoming the heart of many industry or technology parks Daqing has such logistical centers as planned elements of new development zones, which is positive, if they are well executed.
- **Services**: A major requirement for modern industry is effective logistics services, not simply warehousing and delivery. Today, the fastest growing share of total trade is the services provided to plan, coordinate, and manage delivery. Much of this requires vertically integrated services from the bar code on a shipment to the software for arranging and tracking shipments and confirming receipt and payment. High performing regions have strong third-party logistics services that ensure that goods reach their customers.

Transportation and logistics are perhaps the biggest challenge facing Daqing and the Ha-Da-Qi Corridor. Due to their physical location in northeast China, companies along the Corridor must bear high costs to ship their products to the nearest seaport city of Dalian and beyond, and transportation costs serve to diminish the other cost advantages that the Corridor offers. The World Bank has found that in Daqing, the cost of transportation to the nearest port is 1.58 times higher than in the average Chinese city (average of 120 Chinese cities).

The main road and rail resources spanning the Ha-Da-Qi Corridor are riddled with challenges. The major railway resources are the Bin-Zhou Railway, which spans the Corridor and connects to the Rangtong, Bin-Zhou, Jing-Ha, and Ping-Qi Railways at various points along the Corridor. CNPC owns the rail system and thus controls the level at which it is made available for use by the private sector; this being the case, supply falls far short of service demanded, and the service that is provided suffers from unpredictability, delays, and in-transit losses, particularly so in the winter season.

The major road resources are the Sui-Man Highway, which spans the Ha-Da-Qi Corridor and connects at various points to the Tong-San, Ming-Shen, and Jingha Highways. While trucking is more reliable than rail, the costs can be 80-100 percent higher and is thus not a viable alternative for many firms.

The capacity of the Corridor's air transportation and pipes (for chemicals production) also falls short of what is demanded by business.

Corporate investments are being averted from the Ha-Da-Qi Corridor because of the high costs of transporting goods along the Corridor and beyond. The Corridor is in need of creative solutions to address what may be its most pressing challenge—transportation and logistics.

4.7.1. Strengths

- **Two rail lines intersect in Daqing, and the city has 25 rail stations**: Intersecting in Daqing are two rail lines that service both passengers and freight—the Binzhou Railway spans the Ha-Da-Qi Corridor and forms a hub in Daqing with the Rangtong Railway. There are more than 30 railway stations in Daqing (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group). As seen in the table below, freight traffic in Daqing exceeds that of any other city on the Corridor (but highway traffic falls far short of that in the other Corridor cities).

Table 16: Indicators of Transportation/Logistics in 3 Cities on the Ha-Da-Qi Corridor

	Daqing	Harbin	Qiqihar
Total Freight Traffic on Railways (10,000 Tons)	1,447	1,355	998
Total Freight Traffic on Highways (10,000 Tons)	2,011	8,148	5,390

Source: 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar

- **Rail is the preferred method of transportation; it can be over 80 percent cheaper than road transportation**: Rail transportation is often the preferred transportation mode by the private sector because it can be over 80 percent cheaper than road transportation (Interview, Department of Science and Technology of Heilongjiang). Products shipped by rail include raw materials, grain, steel, oil, and gas. (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).
- **A new airport is under construction for Daqing**: The airport, situated 20 km from Daqing city center, is expected to be completed by 2008. Construction began in August 2006 and the design will allow for runways that eventually accommodate 737s and 747s. Freight planes will carry only small products, so no rail modal will be necessary (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).

4.7.1. Weaknesses

- **Rail capacity is far insufficient to meet demand**: In spite of the transportation assets listed above, the Corridor's transportation weaknesses far outweigh them. Perhaps the most immediate transportation challenge facing the Corridor is the bottleneck in the rail infrastructure. China's railway is a monopoly controlled by the central government and freight wagons are in short supply—CNPC has priority usage of the railways, and the rail transportation made available to the private sector falls dramatically short of level demanded.
- **Rail suffers from unpredictability, delays, and in-transit losses**: Though rail is significantly cheaper than trucking, rail service takes longer and suffers from unpredictability, more frequent in-transit losses, and a lack of transparency during transit ("Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006).
- **Trucking is not always a viable alternative, because of high costs**: Many enterprises do not consider trucking a viable alternative to using the railways, as trucking can cost 80-100 percent more than rail transportation. Even so, many firms along the Corridor will opt to pay the higher costs of trucking for their non-bulk cargoes, for the increased reliability over rail transportation. These costs inevitably affect firm productivity and foreign investment ("Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006).
- **Rail and road transportation are particularly bad in the winter**: Transportation out of Daqing and the other Corridor cities is a particular problem in the winter because the national

government uses the railway to ship out natural resources, and in the winter the government is particularly stringent in setting aside freight trains for shipping grains out of the province. Rail transportation available to the private sector falls far short of the level demanded, and trucking prices rise as a result (Interview, Department of Science and Technology of Heilongjiang).

- **New Daqing Airport will lack intermodal efficiencies**: Daqing's new airport is under construction, but runway capacity will be limited until loads are demonstrated, and intermodal efficiencies between the airport, railway, and roads are lacking.
- **Overall, Daqing's investment in fixed assets is low, and city tax structure may need to be examined**: Compared to other cities in China, Daqing's investment in fixed assets is low. In 2003 the city invested 21.5 billion yuan, of which 37.8 percent was for oil exploration, construction, retrofit, and/or maintenance. The city should examine its tax structure, which may be resulting in too small a percentage of its tax base going to the City for infrastructure investments—see Governance section above (Daqing Assessment of Local Industry Structure).
- **Firm productivity and investment are being affected**: Companies along the Corridor as well as within the Daqing-city region have repeatedly raised transportation as one of the most important issues affecting their ability to do business. One company that was interviewed (a large petroleum pipe manufacturer) chose to build an additional manufacturing plant not in Daqing, but in another province, nearer to the end-user customers in order to avoid high transportation costs on the Corridor.

4.8. Power Supply

Delivering energy to industry is a fundamental economic input foundation. Every municipality and surrounding region faces challenges in meeting the energy needs of their different industries. There are three core energy issues that are important for any economy:

- **Availability, Quality and Reliability**: Every industry needs energy that will be delivered on a reliable and consistent basis. However, in many regions energy availability will fluctuate as demand changes, leading to brown-outs or temporary losses. Industries that require uninterruptible power supply will need to invest in power backup in areas with fluctuating supply. Similarly, power quality is a concern and many companies will need to invest in more power controls depending on conditions.
- **Price and Stability**: Energy costs are not always stable or subsidized in markets, for this reason, many industries will avoid locating in municipalities or regions that cannot offer consistent prices. For some industries, if prices rise during certain seasons or times when their use is high, their businesses will suffer. Price stability and reliability is crucial to industrial energy users.
- **Renewable/Impact Cost**: Many industries face national, provincial, and some times local pressures to minimize point source emissions and carbon. For this reason, municipalities and regions that can offer energy sources that incorporate renewable energy or can provide assistance or incentives to industries to adopt renewable energy or energy efficiency measures can attract potential firms to their areas. The secondary consequence of energy generation or use is leading to greater appreciation of industry and technology parks that use co-generation and share energy by-products (as in eco-industrial parks).

The low cost and consistent supply (and surplus) of energy along the Ha-Da-Qi Corridor (provided by CNPC-owned utilities) are some of the region's strongest assets. Companies frequently cite the Corridor's cheaper and more reliable electricity and natural gas as their reasons for locating along the Corridor. Water, gas, and electric along the Corridor are favored in price and reliability over most other Chinese cities.

Despite these present-day advantages, the Ha-Da-Qi Corridor will face challenges in the future to utilize more renewable sources of energy for long-term sustainability of these energy advantages. In the future, collaborative energy solutions for the Corridor could appear as corridor-long pipelines for bio-fuels, or city-to-city commitments to purchasing wind energy.

4.8.1. Strengths

- **Daqing has abundant energy resources**: As seen in the table below, Daqing has a strong supply of energy resources, including electricity and natural gas. The city's current electricity capacity is 1.86 million kW, with 260,000 kW excess supply. CNPC subsidiaries own and operate the electricity and gas utility companies.

Table 17: Indicators of Power and Utilities in 3 Cities on the Ha-Da-Qi Corridor

	Daqing	Harbin	Qiqihar
Power/Transport Interruptions Relative to Sales Revenue (%)	0.7	0.9	0.6
Length of Sewer Pipelines (km)	899	1,390	637
Length of Sewer Pipelines per 10,000 Persons (km)	3.4	1.4	1.1
Rate of Access to Gas and Liquefied Natural Gas (%)	93	77	—
Rate of Access to Tap Water in Urban Area (%)	97	84	—

Sources: 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar; and "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006.

- **Daqing has better water and wastewater operations than elsewhere on the Corridor**: As seen in the table above, Daqing's population has a better rate of access to water and wastewater services than do the populations elsewhere on the Corridor.
- **Daqing businesses have fewer interruptions due to power than other Chinese cities**: As seen in the table below, Daqing and the other Corridor cities compare favorably with Shenyang and Chongqing with a lower level of revenue loss from deficient power or transport among surveyed firms, while Dalian tops the list.

Table 18: Interruptions in Power/Transport in Daqing vs. Other Chinese Cities

City	*Power/Transport Losses Relative to Sales Revenue (percent)*
Dalian	*0.5*
Qiqihar	*0.6*
Daqing	***0.7***
Harbin	*0.9*
Shenyang	*0.9*
Chongqing	*2.5*

Source: "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006

- **Energy costs are lower than the more developed coastal regions**: Energy costs in Daqing are lower than in more developed coastal regions. Low cost and consistent supply are big attractions for companies to the Corridor, particularly those that are energy-intensive.
- **Industrial parks are reported to be meeting companies' basic needs**: Companies in Daqing's industrial parks cite the city's good provision of basic infrastructure to manufacturing plants inside the industrial parks, including roads, basic utilities, and special energy needs.

- **Companies are moving to the Corridor because of energy advantages**: Lower cost and greater abundance of natural gas and electricity were what attracted Gungyi (a glass company) from Hong Kong to the Ha-Da-Qi corridor (Interview, Honggang Glass Park).

4.8.2. Weaknesses

- **Sustainability will be a long-term challenge**: Despite the present-day energy advantages enjoyed by the Ha-Da-Qi Corridor, in order to ensure the long-term sustainability of these advantages, authorities must begin to address critical long-term challenges related to diversification of energy sources, developing more renewable sources of energy, increasing the energy efficiency of major industrial users, and reducing energy-related pollution.

4.9. Telecommunications

In today's high performing economies municipalities and surrounding regions are characterized by strengths and choices in telecommunications. This includes:

- **Modes**: Choice among cost effective options for means of communication. This means choice among wireless, satellite and traditional land line service providers,
- **Bandwidth**: Choice among speed of services for communication and extent of installed high bandwidth at key institutions, from schools to laboratories to government administration. Most regions have options between traditional DSL over landlines, high speed fiber optic, or mixed cable, and also various modes of high-speed wireless providers.
- **Services**: Each country and region may vary in the services available to support users of communication services over the Internet. Maximizing availability of Internet access through domestic providers can assist companies who have limited internal capability.

Daqing has significant telecommunications infrastructure, provided by China Telecom, China Netcom, China Unicom, and Oil Field Communication, but along the Ha-Da-Qi Corridor there is an expressed need by companies for more shared or networked telecommunications systems. Fortunately, vendors are often open to developing services in markets where the potential growth and diversity of customers is strong.

4.9.1. Strengths

- **Daqing Petroleum is Asia's biggest industry-owned ATM optical fiber network**: The ATM optical fiber network built by Daqing Petroleum is the biggest industry-owned optical fiber network in Asia. (Daqing Assessment of Local Industry Structure).

4.9.2. Weaknesses

- **There is a need for more communication information systems**: In their supply chains, some companies are in need of more local communications services. Daqing, for instance, does not have a lot of communication information systems, and some companies have to buy from outside Daqing (Interview #15, Hua Jian Software Company). As seen in the table below the number of internet subscribers in Daqing as a percentage of the population is comparable to Harbin, but is generally lower on the Ha-Da-Qi Corridor than elsewhere in China. Telecommunications is frequently cited as undeveloped on the Corridor (Webster, Douglas and Cai, Jianming, *Preliminary SWOT Analysis: Ha-Da-Qi Corridor, Version 5*, August 6, 2006).

Table 19: Indicators of Telecommunications on the Ha-Da-Qi Corridor

	Daqing	Harbin
Number of Internet Subscribers	332,000	1,202,428
Internet Subscribers as Percentage of Total Population	13	12

Source: 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar

4.10. Environment

Environmental infrastructure is another economic input foundation essential to enabling industry growth. Separately (but related to energy) there is need for water and waste distribution, recovery and treatment systems for almost any target industry that extracts and processes resources. This includes energy, chemicals, pharmaceuticals, agriculture and food processes and even electronics. For this reason and because of the cumulative challenges that industry growth causes, the municipal and regional planning and financing of water and sewerage is necessary to enable diversification. Often new regional authorities are needed to manage and deliver these services, in other cases, sub-regional centers may develop their own advanced air, water, and waste recovery and treatment systems, although costs for such smaller scale developments can be high. High performing economies are now focusing on working with industries and technology parks to engineer industrial processes to minimize resources going in, to more efficiently manage the production process, and to capture and process and recover water and waste coming out. While such activities are more common in developed economies, leadership within a municipality or region can contribute to provincial efforts to manage "green GDP" and make a municipality or region more attractive to incoming industry.

4.10.1 Strengths

- **Recognized as one of first cities to meet national environmental standards**: In 2001 Daqing received major recognition for environmental achievement, becoming one of the first cities to meet the State Environmental Protection Agency's national level of environmental standards.
- **Adequate system for industrial waste disposal**: Daqing has adequate industrial waste disposal; according to a World Bank report, 95% of firms in Daqing meet environmental standards for wastewater disposal. This is behind Dalian and Qiqihar, but ahead of Chongqing, Shenyang, and Harbin ("Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006).

Table 20: Wastewater Disposal: Ha-Da-Qi Cities vs. Other Cities

City	*Percentage of Firms Meeting Environmental Standards for Wastewater Disposal*
Dalian	*97*
Qiqihar	*97*
Daqing	***95***
Chongqing	*93*
Shenyang	*93*
Harbin	*92*

Source: "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006

- **Daqing has the best air quality on the Corridor**: According to survey data, Daqing has the best air quality on the Ha-Da-Qi Corridor. Comparison cities Qiqihar, Harbin, Shenyang, and

Chongqing all lag behind ("Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006).

Table 21: Air Quality in Ha-Da-Qi Corridor Cities vs. Other Chinese Cities

City	*Percentage of Days with Good or Excellent Air Quality*
Daqing	***97***
Dalian	*96*
Qiqihar	*88*
Harbin	*82*
Shenyang	*82*
Chongqing	*66*

Source: "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006.

4.10.2. Weaknesses

- **Sensitive Environment**: The environmental capacity for sewage discharge is low on the Ha-Da-Qi Corridor overall, due in part to the high saline/alkali content of the region (General Program 45-47). Because of the delicate ecological condition of the Corridor, development must take place in an environmentally-informed manner. The Corridor may need to adopt eco-industrial park principles to capture energy, recover and reprocess waste, and manage sewerage and water.
- **High-polluting industries may threaten Daqing's air quality**: High-polluting industries, such as leather, are usually welcomed to Daqing and other parts of the Ha-Da-Qi corridor. In the long-run this could pose a quality-of-life threat to residents (Interview source: Daqing Development and Reform Commission).

4.11. Quality of Life (Housing, Healthcare, and Social Amenities)

A municipality or region cannot attract and retain industry if it cannot meet the housing, healthcare, and social requirements of its workforce. As competition for industry continues municipalities will need to not only continue to meet the housing and health needs of their existing workforce but also be able to attract and retain workers. For this reason, one of the basic items on the list of concerns for any potentially incoming company to Daqing or the surrounding region is whether or not the quality of life is adequate.

Quality of life variables include:

- **Housing**: The affordability and range of choices available to different levels of the workforce and their families.
- **Health Care and Social Services**: The quality and affordability of health care (beyond public services), the quality and choice among social services (child care, older adult care), and the level of public safety (crime rate).
- **Culture and Entertainment**: The range and accessibility of recreational resources from public parks to amusement parks, from theatre to cinema, from amateur sports to professional sports, as well as music, museums, restaurants and culture centers.

Quality of life is a consistent challenge to Daqing and the Ha-Da-Qi Corridor's ability to compete for business investment and employees. Part of this challenge is due to improvements that the Corridor has to make to its housing, healthcare, and social amenities, and the other part of this challenge is due to issues in the way the Corridor markets itself to the rest of China and the world. Regardless, housing, healthcare, and social amenities are essential to successfully

recruiting and retaining the young workforce with the "next-generation" skills that are demanded by the Corridor's most competitive, growing, and seed industries.

In addition, quality of life must be considered not just as a foundation asset that attracts employees and businesses for economic prosperity, but as one of the most important regional outcomes in its own right (alongside prosperity, sustainability, and equity). In this way, high quality of life is more than just a strategy for achieving prosperity—it is an outcome in and of itself that regions must strive to achieve and protect for their residents.

4.11.2. Strengths

- **High concentration of doctors and nurses for population**: As the table below indicates, Daqing has a high number of doctors and nurses per capita, especially when compared to other cities, e.g., Harbin; Daqing has over twice as many doctors and nurses per capita than Harbin.

Table 22: Indicators of Quality of Life in 3 Cities on the Ha-Da-Qi Corridor

	Daqing	Harbin	Qiqihar
Annual Per Capita Disposable Income of Urban Residents (yuan)	13,662	10,065	7,841
Number of Doctors and Nurses per 10,000 Persons	43	16	-
Public Green Space in Urban Area per 10,000 Persons (sq. m)	6.8	7.1	8.6
General Expenditure per Family (yuan)	12,704	9,529	7,320
General Expenditure of Housing Purchase and Construction (yuan)	893	867	245

Sources: 2006 Statistical Year Books for Daqing, Harbin, and Qiqihar.

- **Higher disposable income than elsewhere on the Corridor**: As seen in the table above, Daqing's urban residents have a higher disposable income than do those in Harbin and Qiqihar—however, the cost of living is higher in Daqing (as measured by higher general expenditures per family).

4.11.2. Weaknesses

- **Daqing offers less public green space per capita than elsewhere on the Corridor**: As seen in the table above, Daqing's public green space per capita is lower than in Harbin and Qiqihar.
- **Quality of life is a challenge to attracting and retaining a high-skilled labor force**: Even when companies in Daqing offer the same wages as the coastal regions, Daqing does not compete well in attracting the workforce due to its lower quality of life (Interview, Hua Jian Software Company).

4.12. Marketing

Marketing is a misunderstood capability that is essential to enterprise formation, expansion, and attraction. Often, marketing is strictly associated with promotion of sales or with recruitment. However, in high performing economies marketing capabilities are needed in many stage and forms from actually assisting in forming products that match market demand to creating sales and distribution channels best suited to a given industry, product and customer, to building a brand for a region or municipality as well as its individual firms and products. Because marketing is so often poorly understood, much investment by provinces and municipalities to assist in achieving marketing objectives is not effective. This is most often the case in efforts to market and promote municipalities. Most municipal marketing and promotion involves creating brochures that closely resemble many competitors with respect to profiling their economy and

are presented at trade shows where their is often little match between the generalities presented by the municipality or region and the needs of the attendees.

High performing regions learn that all levels of marketing are essential to economic success and work hard to build bridges between every municipal asset and resource and the needs of specific target markets.

At the most basic level, many municipalities and regions learn that their own firms and institutions have poor comprehension of their products, assets and end markets, and, that firms and institutions often work poorly together to create new products and services that will differentiate their offering from other competitors. By bringing new capabilities to local enterprise efforts can be achieved to create new products, whether in value-added agriculture or tourism or equipment.

The most common problem facing municipalities is that neither they nor their companies have adequate knowledge neither of their target markets, nor of their competitors and how best to reach their customers with effective marketing information. For this reason, municipalities and regions are now frequently bringing together groups of companies and their suppliers and assisting them in defining domestic and international market targets (customers) and are finding and evaluating new distribution channels that will reach them. While individual companies may have effective knowledge of target markets, many may not and most can benefit from better access to wholesalers, marketing partners, as well as promotional efforts with the municipality.

Over time, high performing economies become well known for the industries that make up their economy. For example, the Silicon Valley is known for its technology-based industries; Los Angeles for "Hollywood," London and New York for finance, Houston for oil and gas. Further, these and other regions are known for a wide range of industries that contribute to their overall image and brand. A municipality or region can often play and important role in building and sustaining an image as a center of dynamic enterprise. However, to build a brand, a municipality needs to know its current industries, find its distinctive strengths, and identify a spokesperson from its industry locally or internationally who will testify to the municipality's strengths. Every municipality can build an image. However, doing so without adequate preparation has been proven to be wasteful and sometimes detrimental to future image development. Effective marketing builds from the local assets to global markets and does so with authentic content that matches specific markets, providing the targets with a message in terms that they will recognize and appreciate.

Overall, Daqing has a strong package of advantages to use in marketing the municipality to specific industries and investors. The lesson learned from successful municipalities and regions is that they examine each of their economic input foundations (those described in this report) and match their story to the target market. In the case of Daqing, these strengths are the high capabilities of the power and land supply (e.g., 20 industrial parks), targeted government investment incentives for industrial development, a highly skilled workforce in oil and gas and agriculture that can be augmented to take advantage of new opportunities in value-added activities for both of these commodity sectors, and a substantial investment in research and development infrastructure.

Generally, Daqing has advantages in specialized capabilities in institutions, as well as sites, strong advantages over other parts of China in energy and land, and a variety of government incentives for industrial development.

Daqing has made progress on its image positioning and introduced a new brand image in 2005. Daqing has gained market recognition domestically, but internationally there are still significant challenges in positioning Daqing in order to achieve industry diversification goals. If diversification efforts are to be successful, Daqing must move beyond its geography and historical recognition of a centre known only for it oil and gas distinction. The Daqing-city region must determine which clusters brand images are most important, identify a clear set of values on which to build an image and then determine how best to deliver the message to the target audiences. Building a strong brand requires extensive time and effort.

From a management and logistical perspective, Daqing does not have a long-term plan that coordinates between all the different agencies engaged in promotion. The city's marketing is reactive—they hand out materials at conferences and events, but do not have a strategic plan for city image, target audience, and marketing goals. There is general agreement that Daqing's marketing efforts are not of an "international standard."

Daqing needs to craft an image and a brand that presents the region in the most advantageous manner. (So far, only CNPC has been able to do this, due to its size and history). This involves assessing the image objectives that the region has as a whole AND within specific industry clusters and determining OVERALL image objectives. This is a highly-consultative activity that must take into consideration the view of a broad spectrum of industries, political jurisdictions and citizens.

Specifically, based on a core image for the region, distinctive components need to then be crafted to reflect the needs of individual clusters (and the companies that make up those clusters). The goal should be to identify commonalities that would be a shared asset for each cluster, as well as specific distinguishing image features that would enhance each industry image in key markets.

The story of Daqing's marketing challenges overlaps with its human resources challenges: the city-region suffers from a shortage of professional marketing expertise, and is forced to look internationally for this expertise.

Daqing needs to identify its competitive advantages and package and target these for specific industry audiences. A consistent marketing message must be reached across provincial and city promotional bureaus. Communication and coordination among offices should be continuous, to ensure coordinated steps toward the Corridor's marketing goals.

4.12.1. Strengths

- **Daqing has a strong set of assets to market to the world**: Daqing has a strong package of advantages to market to companies and investors, including: over 20 industrial parks (one at the national level), strong advantages over other parts of China in energy and land, and a variety of government incentives for industrial development (Interview source: Daqing Investment and Promotion Bureau).

- **The current marketing campaign does well in uniquely branding Daqing**: In 2005 the Propaganda and Promotion Department began to brand a new image for Daqing as the "Capital of the Green Petro Chemical Industry and City of 100 Lakes," distinguishing Daqing for its emerging green energy industry and its abundant natural beauty. The Department has done commercials, longer TV spots, business visits, web articles, and even a game show in which viewers choose China's most attractive city to live in (Interview source: City Promotion and Propaganda Office, Daqing).
- **The Foreign Affairs Office is stepping up international marketing**: In 2004 the Office began to set up foreign offices to attract investment to Daqing. To date they are represented in 13 countries, with 19 offices in such cities as: Calgary, Toronto, Houston, Chicago, Moscow, Sidney, Tokyo, and Seoul. In August 2005, the Foreign Affairs Office hosted its first international conference to promote/market Daqing (Interview source: Daqing City Foreign Affairs Office).

4.12.2. Weaknesses

- **In spite its assets, Daqing needs help productizing and marketing itself, especially internationally**: Daqing municipal officials plan on hiring an international management consulting firm to guide the city's marketing. (Interview source: Daqing Investment and Promotion Bureau).
- **Daqing is currently not recognized on the world stage**: Daqing is recognized domestically, but not on the international stage, except in select markets as an oil and gas capital (Interview source: Daqing Investment and Promotion Bureau). In order for Daqing to diversify its economy over the long term, the city-region needs to position its strengths in both the national and international domain. Daqing has already made significant investments into the establishment of foreign office affiliations in thirteen countries, including: Canada, Russia, the United States, Japan, South Korea, and Ukraine. The municipality has indicated that these initiatives are demonstrating initial successes in investment attraction but need to be ramped up. A more focused and targeted international marketing strategy is needed now to augment and sustain these initial successes.
- **Daqing is in need of marketing professionals, and is forced to look internationally for such expertise**: The Ha-Da-Qi Corridor is in need of marketing professionals. As an example of this shortage, currently 50 percent of middle- and high-level marketing managers in Dafeng Agriculture Technology Company come from outside of Daqing (Interview source: #26, Daqing National High-Tech Industry Development Zone, Heilongjiang Dafeng Agriculture Technology Co. Ltd). This type of international marketing assistance could be sourced from the major Chinese cities of Shanghai or Beijing where international marketing and public relations firms have located offices. Or, this talent could be sourced from other countries. Regardless of whether these marketing professionals come from within China or elsewhere, the issue is that Daqing needs to develop a plan whereby international marketing capabilities are "imported" into the region in order to develop effective marketing strategies that will result in a higher visibility of the region in markets where that recognition will lead to decisions to do business with the Daqing-city Region.
- **Daqing companies need help identifying and marketing to international investors**: With the shortage of marketing professionals along the Corridor, this is a widely-cited need by companies (Interview source: #26, Daqing National High-Tech Industry Development Zone, Heilongjiang Dafeng Agriculture Technology Co. Ltd).

- **International marketing and exporting are a challenge since the main client of Daqing's companies is CNPC**: Exporting Daqing's products remains a challenge, since Daqing's technologies and services follow its main client, CNPC, and international markets are limited to CNPC's overseas activity.
- **Daqing needs to target *Forbes* and other publications with the case for why Daqing is a great place to do business**: Daqing needs to utilize widely-viewed lists and publications as venues for advertising Daqing as a great place to do business. In *Forbes*' 2005 survey on "China's Best Places for Business," Daqing ranked #23 in China for investment climate and #9 in China for establishing a manufacturing plant—not stand-out rankings (Interview source: Daqing Investment and Promotion Bureau).
- **Marketing needs to be strategic, not just reactive**: Daqing does not have a long-term plan that coordinates between all the different agencies engaged in promotion. The city's marketing is reactive—they hand out materials at conferences and events, but do not have a strategic plan for city image, target audience, and marketing goals (Interview source: Daqing Investment and Promotion Bureau).

4.13. Conclusions on Daqing's Foundations

Daqing and its surrounding region have many key strengths in the foundations, but a number of critical weaknesses. The foundation advantages represent key areas that Daqing can leverage to drive the diversification of the regional economy. The weaknesses represent areas that need to be targeted for solutions so that industry diversification can be successful.

The table below creates a ranking for Daqing based on its abilities to support its industries in each given foundation category (given the level of information available from foundation analysis and interviews).

The following general conclusions can be made about the quality of Daqing's foundations:

- **Oil extraction is the best supported industry in Daqing**: For the oil extraction industry, Daqing generally has high capabilities in nearly all foundations, but for industries other than oil extraction Daqing's capabilities are mixed.
- **Daqing offers all industries advantages in land and power supply**: Daqing generally offers all of its industries high capabilities in land use and power supply. Land is relatively plentiful, accessible, and incentives are provided for industries to locate in Daqing. And, because oil is plentiful, the amount of electricity generated for the region is plentiful and power supply is very good.
- **Challenges in Daqing primarily revolve around finance and urban planning issues**: The major challenges for Daqing are finance, transportation and logistics, governance, quality of life, and marketing.
- **Availability of financing inhibits growth of SMEs**: Although large state enterprises such as CNPC have access to adequate financing, generally smaller enterprises have difficulty obtaining loans and financing.
- **Transportation is** inadequate: Transportation, even for oil and oil products, is mostly by rail and is not adequate to meet shipping needs. Trucking and other modes of transport are underdeveloped and expensive.
- **Some progress has been made in creating a positive business climate, but major challenges remain**: Daqing has made progress with its business climate through such

offerings as one-stop shops, speedy permitting, and industry incentives for development, but in order to be competitive and diversify the economy, Daqing must address pressing issues, such as its tax structure.

- **Daqing's innovation assets are primarily focused on oil extraction and primary agriculture**: Daqing's universities, research institutes, and other innovation capabilities are high in support of the oil extraction and primary agriculture industries. The region's capabilities in innovation in other industries are insufficient. Moreover, the region focuses on basic research and does not carry innovation through to market (with applied research and commercialization).
- **Daqing has some of the best skills in agriculture and oil and gas, but lacks a high-skilled workforce for other industries**: Daqing is one of the best-educated cities in China, yet its skills are primarily focused on the agriculture and oil extraction industries and lacks the high-skilled workforce of other Chinese cities to support other industries.
- **Daqing has high environmental achievement**: Daqing has some of the best air quality in China and has been recognized for its environmental quality.
- **Quality of life is a persistent challenge**: Quality of life (including housing, healthcare, entertainment, and culture) has been a persistent challenge in Daqing, as the region strives to provide the amenities that will attract people from other parts of China and the world.
- **Daqing must learn to brand and promote itself**: Daqing's marketing challenges are two-fold: other parts of China have negative images of the region. But knowledge of marketing principles and techniques in Daqing is inadequate.

The table below provides a summary of the responsiveness of the economic input foundations to each of the potential clusters in Daqing.

Table 23. Strength of Economic Input Foundations in Support of Potential Industry Clusters

	Innovation	Human Resources	Finance	Land Use	Governance	Transportation & Logistics	Power Supply	Telecommunications	Environment	Quality of Life	*Marketing*
Crude Oil Extraction	High	High	Medium	High	Low	Low	High	Low	High	Low	*Medium*
Gas Extraction	High	High	Medium	High	Low	Low	High	Low	High	Low	*Medium*
Coal Extraction	Medium	Low	Low	High	Low	Low	High	Low	High	Low	*Low*
Shale Oil Extraction	Low	Low	Low	High	Low	Low	High	Low	High	Low	*Low*
Petroleum Refining	Medium	High	Low	High	Low	Low	High	Low	High	Low	*Low*
Metal Fabrication & Heavy Equipment	Low	High	Low	High	Low	Low	High	Low	High	Low	*Low*
Primary Agriculture	Medium	High	Low	High	Low	Low	High	Low	High	Low	*Low*
Value-Added Food Processing	Medium	Low	Low	High	Low	Low	High	Low	High	Low	*Low*
Commodity Chemicals & Intermediates	Medium	Medium	Low	High	Low	Low	High	Low	High	Low	*Low*
Chemical Derivatives & Consumer Products	Low	Medium	Low	High	Low	Low	High	Low	High	Low	*Low*
Electronics Manufacturing	Low	Medium	Low	High	Low	Low	High	Low	High	Low	*Low*
Pharmaceutical	Medium	Medium	Low	High	Low	Low	High	Low	High	Low	*Low*
Information Technology	Low	Medium	Low	High	Low	Low	High	Low	High	Low	*Low*
Bio-Products	Medium	Low	Low	High	Low	Low	High	Low	High	Low	*Low*
Overall Strength of Foundation	**LOW**	**LOW**	**LOW**	**HIGH**	**LOW**	**LOW**	**HIGH**	**LOW**	**HIGH**	**LOW**	***LOW***
Level of Priority for Improvement	***High***	***Critical***	***High***	***Medium***	***High***	***Critical***	***Medium***	***Medium***	***Medium***	***High***	***High***

In the table above, the foundations have been prioritized for improvement. This prioritization is based on input from industry, government, and institutions on the Corridor, through primary interviews that were performed, and secondary studies that were reviewed, through the course of this strategy process. This prioritization is not intended to be scientific, but rather is meant to inform the prioritization of future initiatives on the Corridor.

- **Critical Priority:**
  - Transportation and Logistics
  - Human Resources
- **High Priority:**
  - Finance
  - Innovation
  - Governance
  - Marketing
  - Quality of Life
- **Medium Priority:**
  - Environment
  - Land Use
  - Power and Utilities.

The main conclusions for Daqing are that the city's stakeholders need to collaborate in order to strengthen, sustain, and market Daqing's already-existing assets (primarily land, energy, and some advantages in governance) and work together to create collaborative solutions that will improve the city's present weaknesses (primarily finance, transportation and logistics, and quality of life). Since the very nature of the foundation inputs is that they are cross-cutting and affect the competitiveness of all industries in a region, their solutions require collaboration that includes the range of stakeholders in the region. The following sections of this report will elaborate on recommendations for the development of strategic collaborative solutions for Daqing.

5. Diversification Opportunities

5.1. Introduction

The Daqing economy has been dominated by oil extraction. As oil production declines, opportunities to diversify can and should be actively pursued. Fortunately, significant opportunities exist related to the upgrading of natural gas to petrochemicals, the conversion of coal to liquids or chemicals, the development of oil share, the expanding agriculture, and the development of value-added food processing and bio-products, bio-fuels and industrial equipment. The following conclusion provides an appraisal of diversification opportunities based on the analysis and interviews carried out, drawing from the insights described in the preceding chapters of this report. Here, each candidate is summarized, and development strategy requirements briefly outlined. These materials should become the point of departure for future Daqing diversification initiatives.

5.2. Diversification Candidates

5.2.1. Oil Extraction

The oil extraction industry in Daqing, while extensive, has minimal growth potential. Techniques such as polymer flooding only provide a mitigation effort to a field in decline, not a growth or diversification opportunity.

As noted in the Oil Extraction discussion, the decline in the production of Daqing crude oil is a primary concern that triggered this study. Therefore, the oil extraction industry itself has minimal other ways to produce oil. However, the infrastructure in Daqing and the region (human resources, technical centers, equipment manufacturer's, etc) provides a strong resource base for developing new extraction options as identified in the sections below.

Since actual new conventional oil production from the Daqing region is unlikely, there are several strategic matters that should be addressed. Although Daqing crude production still significantly exceeds local refining capacity, it eventually will decline and jeopardize refinery supply. It is essential to the Daqing city-region, the province of Heilongjiang, and to China overall to ensure that access exists to Russian crude via pipeline. Longer term, shale oil may provide some local supply. In addition, it is feasible and likely economic as Daqing crude supply dwindles to consider reversing pipelines which carry Daqing crude to coastal refineries to allow Daqing to process foreign crude.

These options do not create new local oil supply, but would significantly increase the long term sustainability of the oil supply to the area, which is crucial to the refinery operation as well as petrochemical supply.

5.2.2. Natural Gas Extraction

The discovery of a new, large natural gas field in the Daqing region provides an opportunity for diversification. There are several alternatives which may merit consideration. Based on interviews and published reports, a gas pipeline will be built to carry the Daqing gas to the Harbin region. This pipeline could connect with others to transport gas to Beijing and other regions. This option appears to be driven by CNPC, and is certainly viable. However, this option

would not deliver significant value to the Daqing region. The additional resources and extraction equipment required to produce the gas will be positive, but other options may merit consideration, including:

- Establish a targeted regional area for developing a gas infrastructure for industrial, commercial, and residential gas use for process and building heating. This will retain the use of gas in the region, increase the use of materials to establish the infrastructure, and reduce use of coal or oil-based fuels to meet energy needs.
- Consider investments to convert the gas into petrochemicals for local or regional use. Natural gas can be converted to a wide range of products from the basic conversion of the gas to ethane and then ethylene.
- Consider similar investments to convert the natural gas into urea for fertilizer usage. This would increase fertilizer supply in the region and leverage potential growth of bio-based industries.

The diversification opportunities are options for a portion of the gas supply; there is adequate gas production potential to make progress on several initiatives.

5.2.3. Coal Extraction

Coal production in the HLJ province is strong, and its primary use is for power generation and export to other provinces. The diversification opportunities involve several possible areas:

- Development of large coal-to-liquids (CTL) projects which would convert the coal into usable liquid fuels and/or gas. This process is proven, and its application in Daqing is ideally suited for the strong process-oriented support in the region (human resources, technical expertise, heavy machinery, etc.)
- Conversion to chemicals may be a stronger option since the region has adequate refining capacity, and chemicals provide more potential integration with industries that will grow as the economy grows.
- The logistics of supplying coal from other regions in the province to the Daqing area, and the need to collaborate on the project development and investment with external partners (such as Sasol) may make the coal diversification opportunity more challenging than others to develop. However, it is a reasonable diversification option to consider given the exceptional petroleum and process expertise in the Daqing region.

5.2.4. Shale Oil Extraction

Unlike oil, coal, and natural gas, the shale oil industry is, in itself, a diversification opportunity. Based on the recent find in Mundanjiang, Heilongjiang has the second largest shale oil reserves in China, next to Lianong (Fushun). In addition, there are already two small shale oil producers in the province.

Consequently, the diversification opportunity is to work collaboratively with the key stakeholders within the province and CNPC to develop a shale oil extraction initiative which could be advantaged to the Daqing-city region. This will involve a focused effort on the extraction of the shale and processing it, likely at the source, and the movement of the oil for refining into Daqing. Refining shale oil product may require refinery modifications; however, the shale oil also provides longer term new supply of oil for refineries in Daqing, which would mitigate the threat from ultimate reductions in Daqing crude supply.

5.2.5. Refining

The Daqing region refineries currently have adequate capacity to meet regional fuel demands. They are also the source of much of the petrochemical raw materials.

In a world and nation of limited refinery capacity and petrochemical supply sources, these assets represent underutilized capacity that could be brought to bear on the market. These assets, owned by CNPC, are not directly within Daqing or the region's control. However, they are integral to increasing the contribution of the refining sector to several other industries, most notably petrochemicals, heavy machinery, shale oil processing, and all downstream petrochemical products, and retention of value added in the region.

Diversification opportunities which should be explored include:

- Modification of refinery configuration through capital investment to increase production of petrochemical feedstock and intermediate products (this is already being done, but additional expansion should be considered)
- Expansion of refinery capacity to increase production of fuel products, with the intent to integrate with the coincident development of a product pipeline and depot system to supply the region as well as northeast China, including the Beijing region
- Assess the competitive performance of the Daqing refineries versus leading Chinese and global refineries, and identify potential investments to improve efficiency, yields, and reliability

5.2.6. Commodity & Intermediate Petrochemicals

The petrochemical industry in Daqing and HLJ is strong, but primarily focused on commodity and intermediate petrochemicals. A large portion of these products are moved outside the region, although some is used internally (fertilizer, for example). There is potential for more value added in the full petrochemical supply chain (including derivative products and consumer goods as discussed in the next item). However, any growth in the "downstream" petrochemical industry must be enabled by more robust production "upstream."

The particular options for diversifying petrochemical commodity production include:

- Refinery projects (prior section)
- Conversion of coal to liquid, or gas to liquid projects that result in added petrochemical supply (also in prior sections)
- Development of petrochemical supply from bio-based industries (converting bio-sourced materials into industrial applications, such as paint, etc)

5.2.7. Derivative Petrochemicals and Consumer Goods

Diversification and growth in the derivative chemicals and consumer goods markets require collaboration between the upstream sourcing and the downstream consumer requirements.

There is significant commodity and intermediate production in the Daqing region, and potential for growth. Since a large amount of the petrochemical commodities and intermediates are exported to other provinces, this represents a large diversification opportunity (e.g., conversion of the commodity chemicals into consumer goods). Moreover, the production of consumer goods (such as textiles, plastics, etc) would enable other businesses to have a more local source of supply for their needs (for example the pepper company). An opportunity exists to develop incubator

businesses which would utilize available, or growing, petrochemical derivative products to enable bringing consumer products to market.

The diversification opportunity is to take the intermediate products that are being exported coupled with incremental production that may derive from diversification opportunities in other areas for petrochemicals and turn them into value-added products in the consumer goods area.

5.2.8. Primary Agriculture

Similar to the petrochemical industry, a significant percentage (over 73%) of the crop production is exported. Daqing exports more grain than any province in China. Therefore there is significant opportunity to add value within the province.

Primary agriculture is similar to oil extraction and is a primary strength of the Daqing economy. It is fundamental to a number of other businesses in the area – in particular bio-industries.

The diversification opportunity is to take primary agriculture (focusing on corn and wheat) and start looking at what it takes to grow other things and at the same time maximize the value of what is produced from the existing soil (both good and bad). To do this, the major issue to address is how to make the primary agricultural sector stronger and diversified. Initiatives that address the issue include:

- R & D must be done on increasing crop yield per acre.
- Ways must be found to grow crops on marginal soil. For instance, certain crops may not be appropriate for food but would be adequate as raw materials for bio-fuel production (e.g., switchgrass production for ethanol).
- Expand research into the development of crop techniques for use as bio-fuel production rather than food. Attempt to expand the season (crop genetics, etc.) Bio-fuel production comes from three areas: starches (sugarcane, corn); animal fat and residue (bio-diesel); and bio-mass (forests). Bio-diesel can come from soy, rapeseed oil, jatropa, etc. There is a soy-based bio-diesel plant already in the province or being constructed. Given these options, the primary agriculture sector must have the best technology to grow corn as effectively as it can grow soy, rapeseed, etc.

5.2.9. Food Processing

Presently most of the raw crops are exported from the province. The diversification opportunity is to take the raw materials and turn them into consumer goods. The pepper company is a good example (see interviews).

In addition to logistics issues and financing concerns for new enterprises, a major challenge to address is the perception of quality. Western food is imported that is of better quality. The required strategy therefore may be to collaborate with a western company to develop a factory and/or food processing plant to develop products that are similar to what is produced in the West. This would enable China to develop industries that bring food processing and packaging to the market consistent with Western standards with respect to food, management, and packaging quality.

5.2.10. Bio-Industries

The province has some strong initial experience with bio-fuels, and is already blending ethanol in gasoline. The base agriculture capabilities in the province provide a solid platform to launch a more broad application of bio-industrial products. The entire category of bio-fuels represents a

diversification opportunity for the region. Potential areas to consider broadening and deepening the bio-industries' contribution to Daqing and the province include:

- Expand local capability to produce ethanol for blending in gasoline. This may result in the production of more ethanol than could be used in Heilongjiang province. If so, it would be possible to supply neighboring provinces with ethanol. (If ethanol could be railed to Beijing and blended in gasoline there, it might improve environmental considerations in the city)
- Create and grow a cellulosic-based ethanol industry in the Daqing-city region, potentially using new agricultural sources (switchgrass, etc) from marginal soil, or using corn husks or rice straw as raw material.
- Develop production of bio-diesel in the Daqing-city region through use of soy and other raw materials (rapeseed, animal fats, etc). The production could be blended with diesel fuel produced in CNPC refineries. This will require coordination with CNPC on the blending as well as quality issues.
- Identify and develop opportunities to produce petrochemicals or pharmaceutical products from bio-based sources. Examples could include the development of bio-based opportunities in the PVC (poly vinyl chloride) market, which would focus on the processing of vinyl chloride monomer to the polymer, including the use of plasticizers based on bio-products, and the increased incorporation of functional fiber and/or cellulose in finished products.

Near Term Opportunities

- **Bio-ethanol**: Leverages agricultural feedstock and benefits from existing area projects
- **Bio-diesel**: Multiple fatty acid sources—tallow, yellow grease, soybean oil, only pilot plants exist.
- **Bio-fiber**: Input substitution strategy with potential in automotives, can combine recycled and new fiber materials (hemp) from region for insulation and
- **Agricultural Waste Recycling**: Fertilizer or energy from agricultural waste, capturing value for regional markets, possibly exports.
- **Nutraceuticals**: Bio-flavanoids from greenhouse surplus or waste (such as lycopene from tomatoes).

Mid Term Opportunities

- **Industrial Enzymes**
  - Market for soybean peroxidase that should grow due to demand from other bio-products.
- **Bio-based Plastics**
  - Bio-based plasticizer for PVC.
  - Corn starch based poly lactic acid.
  - Bio-based polyhydroxybutyrate as a feedstock for polypropylene.
- **Bio-based Resins**
  - Pyrolysis/ bio-enzyme.

Longer Term Opportunities

- **Biotechnology application in crops**
  - Castor oil genes for motor oil in soybean.
- **Environmental Remediation**
  - Bio-based cleanups using advanced enzymatic techniques (harnessing existing regional capabilities in microbial processes).
  - Mineral recovery (advanced microbial extraction processes).

5.2.11. Heavy Machinery

There is a significant level of heavy machinery companies in the region supporting primarily the existing oil and gas infrastructure. Opportunities will exist to expand that business as the chemical business and shale oil industries grow. However, this industry must take steps to improve the quality of the machinery and equipment produced to be competitive in a global market, or the growth potential will be limited at best.

A different area of focus would be to the machinery and equipment developed to provide energy to businesses and consumers (furnaces, water heaters, distributed generation equipment, lighting etc). This could be a fruitful diversification area for this support cluster; however, the growth may require stimulus that Daqing and provincial government could lead. This stimulus could be improved standards for energy efficiency in buildings, machinery, appliances, etc, with incentives provided to manufacturer's choosing to market energy-conscious products.

The development of an effective energy conservation initiative in this region would provide a number of regional and national benefits. First, energy usage would decline, favorably impacting national and regional balance of payments. Second, industries which support energy conservation markets, including insulation, boiler, and furnace control systems, lighting companies, compressor manufacturer's, etc would find a local market for products, and a good base for expansion within and outside the region. Consumers would realize additional spending capacity, which would stimulate demand for other consumer goods and grow the economy.

In a market which has had relatively secure and low cost access to energy supply, there may not be a natural development of the energy efficiency mindset in consumers or in the leadership. The use of controlled fuel prices in the nation is a contributing influence which could slow development of a marketplace for energy conservation products.

5.3. Diversification Strategy Options

Diversification of the Daqing economy should begin with an overall diversification strategy process that will confirm the potential of the candidates recommended here (and presumably in other studies). This strategy process should then establish an integrated structural process for managing an ongoing diversification strategy implementation process. The diversification program should be based on applying the cluster development framework described briefly in this report and be continued as an ongoing effort to form, expand, and attract industry.

For each candidate industry for diversification there will be different potentials for new enterprise development, expansion of existing businesses and for recruiting or attracting international and national partners. The ideal outcome of a future diversification process would be to ensure that for each candidate industry the range of economic input foundations that can contribute to cluster development are well engaged and their actions effectively aligned. If this can be achieved, the diversification strategy will focus a continuum of Daqing advantages, from innovation, to human resources, financing, land use, governance, transportation and logistics, energy, environment, quality of life and governance on each target. This process will not only enhance success by building diversification targets but will also enhance ongoing economic development in Daqing and the surrounding region.

Some of the options for diversification along with the challenges and key considerations to pursue them have been noted in the preceding sections. The major question that will be discussed here is what should the Daqing authorities do and in what sequence to achieve the desired outcome? The ICF team understands that a broad strategy for economic development is being developed by the regional authorities. The focus here, therefore, will be on strategic initiatives or actions that should be considered for each cluster.

5.3.1. Energy (Extraction, Refining and Services)

In the assessment and diversification opportunities section, it was noted that extraction includes crude oil, natural gas, coal, and shale oil.

Crude Oil

For China, the increased dependence on imported oil represents an economic and security threat which must be addressed. It is essential that the Daqing city-region:

- Pursue further work to enhance technology to enhance recovery;
- Work with the national government and CNPC to develop alternative supply plans for long term replacement of Daqing crude. These should include assuring access to Russian crude oil via pipeline, development of any local shale oil supply, and planning for reversing of crude oil pipelines to allow Daqing access to crude oil from waterborne imports.

Natural Gas

In the assessment section it was noted that natural gas could be used for several different purposes:

- Power generation – in this application it would most likely displace coal. Natural gas would provide a clean burning alternative fuel source, which would have some social benefits to the region;
- Residential or commercial applications, primarily for space heating. This would entail some significant growth in infrastructure in the province (initially Daqing and Harbin) to construct local distribution networks, metering, etc. to physically position gas into homes and buildings. These type conversions are very slow to occur, and may best be focused in new-construction regions;
- Feedstock for petrochemical production. This could provide some additional value added for CNPC, as well as incubator businesses, although this would require some significant collaboration to maximize value and produce products desired in the region.

The major strategic initiatives that should be considered are:

- Review and assess the major uses to which natural gas should be put. A fuel use policy may be required. For instance, in Alberta for many years the government policy was to use coal to generate electricity and natural gas for direct consumption in homes for heating and cooking.
- If it is determined that natural gas be used a feedstock for petrochemicals, a processing policy will be required. In Alberta, for instance, the government requires that natural gas liquids (ethane, propane, butane) be separated from the natural gas when it is processed close to the well head. Coupled with this policy, the government adopted an ethane policy intended to assure petrochemical plants an adequate supply of feedstock.

Coal

The Daqing region has very strong expertise in processing capability and in a value chain supporting process industries, due to the existing refinery and petrochemical facilities in the area. Hence it may be a candidate for a location of a coal-to-liquid (CTL) facility.

Consideration of the optimal product to convert the coal into would require several initiatives:

- Conduct, possibly with CNPC, technical and economic feasibility studies to utilize existing technology to upgrade coal to gas or liquid products. The entire supply chain would need to be assessed, including whether petrochemical base stocks or refined products, or simply natural gas are the optimal product.
- Focus on the use of Daqing assets and expertise to facilitate the development of a CTL process in the Daqing region.
- A review of the optimal use of various fuels. It may be that coal is best used for generating electricity or steam for heating, and that it may be more beneficial to consider petrochemical options for coal.

Shale Oil

To develop shale oil, leadership from CNPC will be required as well as the support of the national government. Ideally, China could be a global leader in the development of shale oil production. While it is likely that China may require some foreign investment and technical resources to collaborate on this project, China has the opportunity to be seen as a pioneer in the practical development of shale oil resources.

The Alberta experience with development of the oil sands suggests that several initiatives will need to be pursued. First, an assessment is required of:

- The location, scope, and potential reserves of the regions' shale oil reserves, including reasonable estimates of daily production level at maturity.
- Accessibility of the reserves (extraction process, physical handling, etc).

Second, the technology for commercially producing the oil shale must be developed. In Alberta, this development took many years and involved extensive work by public institutions such as the Alberta Research Council (ARC) under which the Clark extraction method for separating the oil from the sand was developed. It also involved innovative partnerships between industry, academic institutions, and the Alberta Oil Sands Technology and Research Authority (AOSTRA). Over a twenty year period, AOSTRA and industry and academia collaborated on experimental projects to develop the technology for producing, extracting, and refining the crude oil from Alberta's tar sands.

Third, an assessment will be required of the potential investment requirements for the complete development of the supply chain, from local shale oil extraction in the Mudanjiang region, to transport of the oil to refiners in Daqing, to processing of the oil in the refineries.

Petroleum Refining

Despite the fact that current fuel supply appears adequate, CNPC may want to consider developing additional refining capacity in the Daqing/HLJ region, with the express purpose of providing refined products (and possibly petrochemicals) to the Beijing region by pipeline.

Commensurate with the additional refinery capacity, there will be a need to develop an oil product distribution (pipelines, tanks, etc) network, initially reaching to Beijing and then networking to other regions in the corridor between HLJ and Beijing. The added refining capacity will enable the production of higher levels of petrochemical base stocks.

Before additional refining capacity is considered it will be necessary to complete the following, both which will require collaboration with CNPC:

- An assessment of the optimal method & cost to upgrade the refineries
- A thorough feasibility study of the refinery assets, and the markets for the modified product slate.

One of the many issues which would need to be resolved is the ability to retain Daqing crude in the region to provide crude for the expanded refineries. Alternatives for supplementing local crude are

importing Russian crude via pipeline or rail, and, longer term, developing shale oil supply. There may be concerns about taking Daqing crude away from other refineries that are currently processing it, but many of these refineries have direct access to waterborne imported oil.
The fact that Daqing crude oil is declining does not lead to a conclusion that investment in refining capacity is illogical. Access to Russian crude, local shale oil, and potentially feedstocks from coal to liquids projects enhances supply sources. In addition, Daqing could have economic access to waterborne crude imports through reversing existing pipelines from the coast. Transporting crude oil inland through existing pipelines is far more feasible than transporting products inland through rail, truck, or new product pipelines.

5.3.2. Chemicals (Commodity, Specialty)

Rather than a continued regional focus on oil production, Daqing government and industry leaders should consider focusing on refining, petrochemical, and derivative products as one core growth area. Basic commodities and intermediate chemicals are not produced in significant quantities in Daqing for several reasons:

- Base stocks and intermediates are exported to other areas in China due to cost issues in the Daqing area (e.g., fuel needs due to weather), which may make further petrochemical upgrading uncompetitive.
- Logistics of additional petrochemical derivative production and consumer goods would be constrained in getting out of the region (especially in winter).

Overcoming these weaknesses will require a number of initiatives:

- Conduct an assessment of what are the right products to produce and how to create an enterprise able to do that. For instance, can polyethylene or ethylene be turned into Styrofoam, fertilizers, insulation, plastic containers, plastic piping which could be exported from the region?
- What economic factors inhibit these opportunities from being developed today (logistics costs? Demand factors, etc?)
- Daqing needs to identify the consumer goods that would be of the greatest value to the people of Heilongjiang and the people in neighboring provinces. For instance, insulation may be in demand. If there is insufficient insulation in residences, then there should be a concerted effort to develop chemical products that promote energy conservation, etc.

5.3.3. Input Advantages for Energy and Chemical Diversification

The cluster based logic suggests that enabling diversification among the energy and chemical related cluster segments will be easier when there are economic input advantages that can be applied to the strategic development issues described. The diversification candidates described above were chosen, in part, because of the distinctive advantages in the Daqing area and across the can be drawn from. The following summarizes examples of these advantages that would be harnessed in the diversification strategy development process. These examples are drawn from the interviews conducted and data reviewed for this report, but they are only illustrative, not comprehensive:

Innovation

- The Daqing Petroleum College works closely with Daqing CNPC China companies in R&D, particularly applied research. However, Daqing Petroleum College could initiate research on

its own and with other R&D centers or industries relating to energy and chemical development themes.

- The university-industry linked Petroleum R&D centers could advance innovation and help share costs and benefits of R&D results to assist energy and chemical-related diversification. For example, the High Molecule Material Technology R&D Center and the Fine-Petrochemical Research and Development Center are major resources.

Human Resources

- Daqing, home to China's largest oil field, has some of the best technical skills in the industry, with scientists at Daqing Petroleum College, and 15 R&D centers and thousands of researchers and scientists under the CNPC Daqing subsidiary companies. All these institutions could provide expertise and workforce skills for future diversification development, under appropriate collaborative management.

Finance

- The Daqing CNPC subsidiary companies, themselves, do not have any financing issues because they have CNPC as their financing source. However, the Daqing CNPC subsidiary companies do not have autonomy in its decision making. National support for new use of financial resources would be helpful in enabling diversification of the energy cluster.
- The Daqing Commercial Bank sees Daqing CNPC equipment and service provider companies as a target industry for financing support. Therefore, financing for SME projects in this industry is more available than for other industries overall.

Land Use

- Daqing has several tech parks with preferential land use and infrastructure provisions for the energy and chemical-related industry including the Fine Petrochemical Products Park. The 4-square-kilometer park was originally developed in 2003 for CNPC. Companies in the park benefit from free use of land, grants of 500,000 RMB for construction, and use of raw materials and services from the adjacent CNPC plant.

Governance and Business Climate

- Daqing municipal and Ha-Da-Qi Corridor permit streamlining processes should help energy and chemical-related diversification activities, particularly those to be attracted to designated industry and technology parks. However, ensuring environmentally progressive policies will require strong planning and preparation.

Transportation and Logistics

- Daqing faces a need to organize and resolve seasonal transportation and distribution issues that would impede future diversification of energy and chemical related cluster segments. Rail service volume is an issue, which if addressed in advance would ease locational decisions. Future trucking and warehousing services will be important, through designated multi-modal centers. Resolving pipeline infrastructure development will also be essential to promoting future development of energy and chemical-related cluster segments given locational advantages of coastal regions (near customers and energy delivery infrastructure).

Power Supply

- The region's affordable power supply and potential to harness new sources arising from the diversification of the energy cluster into gas, for example, will be an advantage for recruiting candidate industries and energy and chemicals. These advantages must be clear given higher energy utilization needs necessitated by the seasonal weather conditions.

5.3.4. Agriculture (Primary, and Value-added Food Processing)

Value-Added

Value added allows producers to gain additional profits by differentiating their products or by adding value to it before selling it. Total food expenditure in the US has steadily increased over the last 40 years, whereas the farm value of food (in real dollars) has almost remained constant[104]. Therefore the cost of processing and marketing are the high growth components of the food value chain. Frequently, investors overlook the potential of innovative ideas and focus exclusively in traditional and "safer" alternatives; hence value added is often not well understood.

AgVentures Alliance is a cluster-like initiative that was developed by Don Hofstrand, a Regional Farm Management Specialist at Iowa State University Extension in the mid 1990's and a group of 25 farmers concerned about the challenges and opportunities of diversifying into value added products. The organization's mission was to facilitate the development of value-added agriculture projects by providing technical and other access to finance. Golden Global Eggs is a successful example of a collaborative project where 700 farmers invested in 5.5 million bird capacity laying facility in Iowa. The cooperative had the vision not just to sell eggs, but to move up the food chain directly to the consumer with ready-to-cook egg products. Farmer members have recently changed the organizational structure to an LLC to allow for more creative financing opportunities.

Daqing's food processing industry has included some level of value-added to its products and processes; however firms do not know how to market its value-added products. According to a source at the Department of Science and Technology of Heilongjiang, food processing is one of Heilongjiang's six provincial priority industries and Daqing has the advantage of good natural resources as it relates to food processing, for example a vast land suitable for farming; crops such as pepper, peanuts and soy.

Soy value-added products could spur innovation in the industry and across the region and this opportunity should be given serious consideration. Non-food value-added applications, such as in paints, dyes, inks, plastic precursors and plastics, could be an opportunity for diversification. With China importing 30 million tons of soy per year and the Heilongjiang province having lower oil content than imported soy, Heilongjiang could tap this huge existing domestic market for its soy value-added applications. Furthermore, Harbin is home to the National Soy Engineering Center at Northeastern University, but their focus is still primarily at the value-added food level, not chemical feedstock and value added chemicals. Clustering in the region would accelerate the process of aligning the economic foundations of the region to the exporters and market needs.

Alberta Agriculture, which has a long standing relationship with the City of Daqing, recently signed an agreement with Heilongjiang to build a food processing centre in Daqing. This facility will help Chinese food processors integrate technology into their food manufacturing processes and will also allow Alberta's value-add companies to have increased access to the Chinese marketplace and work with the government on legal requirements for China.

[104] Value Added Opportunities and Strategies, Coltrain, Barton and Bolland, Kansas State University, 2000

The cases discussed below provide further insights on the value generating opportunities that lie in diversification from traditional crops into other more profitable food and non food businesses[105].

- **Dakota Growers Pasta Company**: Carrington, North Dakota - In January 1992, a group of producers decided to establish a grower-owned, closed, processing cooperative of durum wheat growers. Members were required to purchase a minimum of 1,500 shares at $3.85 per share, so that they could obtain delivery rights to a future pasta plant. A total of 1,040 durum producers invested $12 million in the project, which was 30 percent of the $40 million needed to build the pasta plant. Production began in November 1993 with a capacity of 120 million pounds. In 1998, shares originally purchased for $3.85 were worth $15.
- **Phenix Manufacturing**: St. Peter, Minnesota—An organic building material that looks like granite, but works like wood—EnvironTM—is made from soybean meal and post-consumer newspaper. It can be used to make counters, flooring, and furniture. Phenix Manufacturing is a 1,000 member farmer-owned cooperative that invested $10 million in initial equity and committed 35,000 acres to soybeans. Another organic material, Clean Green, has been developed from corn and wheat starches to replace petroleum-based plastics. This material biodegrades in a matter of months and is a renewable resource.
- **21st Century Grain Processing Cooperative**: Rincon, New Mexico - A flour mill located in New Mexico, but owned cooperatively by Kansas wheat producers, opened in 1998. This flour mill adds value to producers' raw commodities by further processing wheat into flour for tortillas, a product with an increasing demand. Each share of stock purchased by members for $5,000 provides ownership in the flour mill and obliges them to supply 2,850 bushels of wheat each year. A total of 550 wheat producers supplied $2.7 million of equity stock to become members of this venture.
- **North American Bison Cooperative**: New Rockford, North Dakota - This cooperative raised 100% of the funds needed to build a $1.6 million processing plant with equity investments from 180 producers in 1993. Shares were sold for $250, with a minimum of 10 shares and no maximum. Each share entitled the bison producer to deliver one finished animal a year to the processing plant, which currently processes 10,000 bison per year. The processed meat then is marketed to upscale East Coast restaurants and Europe. The cooperative has been so successful that additional processing plants are being discussed. Much needed development of processing facilities, markets, and marketing channels was achieved by this cooperative through partnering with experts. Ken "Doc" Throlson had a dream to process bison and was a key leader in starting this value—adding cooperative.

Organic Products

- **Diversification Opportunities**: The organic segment offer excellent diversification opportunities to firms in the agriculture and food processing activities. Although growth in the sector is expecting to level down, expected growth rate for the next years is near 20%.

  Organic farming and food, strategically implemented and managed, would enable China to position itself as a player in the value added agricultural markets, while securing healthier food for the its residents. The niche nature of the organic market offers small producer excellent opportunities to develop value added products to target countries with high levels of income and with an increasing demand for organic products.

  Furthermore, organic farming offers a sustainable solution to help address the issue of rural poverty that has a devastating effect in the Chinese inner rural areas.

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[105] Value Added Opportunities and Strategies, Coltrain, Barton and Bolland, Kansas State University, 2000

- **Strategy**: Organic certification is the key action that Chinese producers have to take in order to further their access to the major international markets as sellers of organic products
  China could leverage the Organic Food Development Center, SEPA of China to offers organic certification services and operating inspections for OCIA certification programs via the OCIA China Chapter. OFDC and OCIA China Chapter have more than 400 clients across the country. Certified organic products by these entities have been successfully exported to countries all over the world.
  However, the local acceptance of the "Green Food" label has hindered the development of the organic market because “green” is best perceived by consumers and organic is hardly known at all. China needs to develop and implement a widely accepted organic certification standard that builds on the reputation and market acceptance of its competitor “Green Food” label. The current slow development of the Chinese organic sector is due in part to the lack of awareness of consumers about the health and environmental benefits organic products compared to “green” products. Because of this, stronger marketing is needed in the private sector. By leveraging the strategic value of the local brand to develop unique and reputable standards, Chinese organic products stand a better chance of succeeding in the competitive marketplace.

5.3.5. Bio-Fuels and Bio-Products

The development of a bio-fuels cluster has several models. Brazil has been a leader in the development of ethanol use in fuel. Much of Brazil’s impetus for ethanol was to reduce oil imports and extend use of the sugar crop, through requirements established by the government.

In the United States, the growth in ethanol use has been driven by mandated requirements by the Federal government in states and regions with excessive air pollution, and individual state mandates. The United States has also provided significant tax subsidies for ethanol and bio-diesel blenders, and is actively funding research into ways to stimulate additional bio-fuel production from cellulosic and other sources. The government mandates and incentives, couple with an import tariff penalty, have stimulated domestic ethanol supply from corn - complementing initiatives to expand use of E85 gasoline (85% ethanol blends), flexible fuel vehicles, etc.

These national examples may be less illustrative than a closer look at initiatives in Ontario, Canada. Ontario has had a high concentration of agriculture, chemicals, and automotive production and was interested in diversifying their economy. Their situation was somewhat like Daqing, except Daqing has much more oil industry and less automotive. Ontario, working with ICF, developed a collaborative approach to develop a bio-product industry that aligned with their primary industrial clusters. Key principles are listed below (the report substitutes Daqing for Ontario to indicate how this approach may pertain to Daqing):

- **Define Bio-product Innovation Need or Opportunity**: The Daqing Regional Innovation Network (DRIN) will always be demand driven. For this reason DRIN will form teams from among its members, as described above, for the purpose of defining specific bio-product innovation priorities. The executive director will then work with the private sector stakeholders and economic input foundation resources members of DRIN to build collaborative teams to advance each specific project. In the course of advancing each project DRIN will identify and engage new stakeholders that are more explicitly concerned with the specifics of a given project. The goal of a Convergence Project is to foster accelerated development and adoption of bio-products innovation in Daqing, and eventually across the

entire province. Therefore, each bio-innovation project will have its own distinctive focus—and can have multiple foci.

Bio-product Convergence Projects may emphasize one or all of these specific aspects of bio-products innovation:

- ***Discover***: Early stage research, possibly pre-competitive consortia on improving plant performance. A consortium sponsored by multiple companies as well as federal or provincial agencies that wish to leverage R&D results might be the vehicle used to structure pre-competitive research on bio-products. The performers of the research may be university or college faculty working through a consortia project—at a university or independent laboratory facility, which could be a designated convergence site, such as a technology park.
- ***Develop***: Take an established scientific discovery and transform that knowledge into a viable commercial product. This may mean undertaking contract research for one or more sponsors, focusing on proving and testing an application, such as the ability of a bio-plastic or bio-paint to meet engineering specifications and creating performance standards for an industrial application. A near-term project that may merit study would be the evaluation of the range of environmental impacts of bio-fuels under different production and climatic conditions.
- ***Deploy***: Demonstrate and transfer an established or available bio-product innovation to the region's industrial users. Proposals have already been generated that would focus on creating information systems that match university research findings or skills to company needs; compare and evaluate new bio-product innovations that companies could use for energy, chemicals or materials, and educate firms about emerging best practices, including establishing demonstration projects for those purposes.

Whatever the case, the impetus for a given bio-product innovation project will be outlined by stakeholders representing industry clusters and those working with them—as actions must reflect a set of market-driven needs, such as proving or testing a given bio-product.

- **Seek Natural/Agricultural Resource Opportunities**: DRIN will serve as the intermediary in bringing together the natural and agricultural resources that are the key elements in sustainable bio-products growth. This means that each Convergence Project will involve one or more of these features in its development:
  - ***Reuse-Land***: A fundamental focus of DRIN is on linking bio-product activities to more environmental sustainable land use and development. Therefore, in a typical convergence project, owners of land across Daqing would be invited to participate in development of proposals for bio-product innovation initiatives—as convergence sites. Sites could offer or be invited (perhaps through a competitive bid process) to participate. Potential sites would include brownfields or underutilized industrial or public lands.
  - ***Add Value to Resources***: The DRIN focus on enhanced use of natural and agricultural resources will be reflected in the underlying objectives of each convergence project. Projects at any given site will be designed to use agricultural bio-mass (commodity or waste) or to produce an output that would add value to the region's natural resources (off site).
  - ***Improve the Environment***: The goal of improving sustainability of the regional economy is also embedded in the land use and environmental objectives of each convergence project. All sites will be assisted to embrace principles of environmental sustainability—whether by reducing energy and materials use, generating energy (co-generation), or producing less waste or reducing environmental emissions.

DRIN will examine each Convergence Project opportunity in terms of this set of opportunities, independently from those pertaining to innovation.

- **Build Market Relationships and Improve Dynamism**: Each Convergence Project will be a "living laboratory" for bio-products innovation. DRIN will use these projects as the "platform" that can, as noted earlier, accelerate the development and adoption of bio-products. In doing so, DRIN will help achieve: formation of more bio-product related enterprises; expansion of existing regional companies who may supply or use bio-products—via reduction of their costs (new feedstock), productivity increase (performance improvements), and diversification of products or product features required by the marketplace, and; attraction of larger non-local companies, who will produce or utilize bio-product inputs in their businesses. For this to occur DRIN and its Bio-products Innovation Leadership Group will literally serve as a market intermediary. The key, however, is for DRIN to create a strong capacity to:
  - ***Promote Supplier-Producer Linkages***: Accelerating bio-products development and utilization is, to a significant degree, about overcoming market inefficiencies (market failure) that often characterizes the early stage of a period of innovation and associated market development. For this reason, DRIN will focus its attention—through its Convergence Projects *as well as ongoing activities across the region*—on building new bridges *between* firms. A crucial need that DRIN can help facilitate is improving linkages between bio-products innovators and users—to find suppliers and customers. This will also include business matchmaking between those offering bio-product inputs (such as agricultural commodity producers and processors), those developing bio-products (chemical firms and specialty chemical or plastic firms), and those using the spectrum of bio-products (energy firms, automotive firms, component producers). This activity can be accomplished through regional bio-product trade forums as well as through maintaining a simple regional on-line bio-innovation exchange where producer and suppliers can find one another.
  - ***Attract***: DRIN will focus on the goal of forming, expanding and attracting bio-products industry and users to the Daqing region. To achieve its attraction objectives DRIN will focus on two fundamental objectives: First, ensuring that any bio-products related enterprise can secure an advantage in the economic inputs it needs to do business and second telling this story of advantage to potential incoming companies:
  - ***Build the Bio-products Advantage***: History shows that regions that offer distinctive advantages in the specific inputs needed by specific clusters tend not only to form and expand companies in a given cluster, but also attract firms that benefit from aggregating near similar businesses. For this reason, a fundamental activity of DRIN will be to systematically identify and broker linkages between bio-products firms and bio-product user firms and local, provincial, and federal economic input foundations. This is the reason why DRIN will be organized: DRIN will be able to bring existing providers from any location together with firms that have specific needs for research services, skills training, financing, infrastructure (serviced sites), and just-in-time governance assistance (planning, zoning, permits, industrial land services, financing). At any Convergence Project site DRIN will focuses explicitly on identifying and matching existing market or public services to bio-product company or associated partner needs (e.g., this might include workforce training for a new bio-ethanol, bio-diesel or bio-ethylene or fiber composite plant; or it might include land assembly, rezoning or permitting for a eco-industrial park). *Through the nexus of relationships that DRIN will offer, the advantages for building bio-products-related businesses in Daqing will expand and become more readily recognized.*

- ***Promote Daqing's Bio-products Advantage***: DRIN will rapidly organize a consortium to define and promote this region's advantages as a place to locate bio-products related businesses—whether producers or users. This will include ensuring everything described in the preceding passage is true—that the region can deliver what any bio-products related firm needs - from innovation to skills to sites. Eventually DRIN will be able to promote the entire province of Heilongjiang as a place for bio-products advantage. Second, this requires creating an ongoing market communications program to introduce and promote the region to headquarters or expanding companies. Moreover, this will also require direct outreach by regional firms and community teams to parent headquarters of firms with an interest in bio-products from energy and chemicals to automotive.

5.3.6. Input Advantages for Agriculture, Value-Added Food Processing and Bio-Product Diversification

In order for agriculture and value-added food processing to grow faster than competing regions, Daqing needs to do more than partner with international firms that bring production and processing expertise. Daqing needs to create its own distinctive capabilities to identify and develop crops, value-added foods, and new bio-based products. The example provided above is a concrete approach that has been used in other regions.

As with energy and chemicals, the diversification candidates and development directions proposed for primary agriculture, value-added food processing and bio-products were chosen, in part, because of the distinctive economic input advantages in the Daqing-city region and across the province that can enable diversification. Diversifying agricultural production, generating new value-added products and creating new bio-products is a direction well suited to Daqing's capabilities, but doing so requires expanding existing, as well as creating new, resources for knowledge and application. These are reminders of existing assets on which the future can be built—but to achieve diversification, advantages must be created that help form, expand and attract target industries:

Innovation

- The Province of Heilongjiang generally and the Daqing-city region specifically, have distinctive agricultural research capabilities. These have focused primarily on enhancing primary agricultural products, which is essential. However, to diversify, Daqing will need to be able to conduct research and development and apply it to emerging market needs and opportunities across this continuum of opportunities.
- The National Soybean Seed Quality Resource Center is the only national research center solely focused on R&D, production, development, and marketing of soybeans. It has 101 professors and scientists and 17 visiting researchers. Currently, it has developed seven new soybean varieties and nine new products for the marketplace. However, the Center could be advanced to focus on soy-based bio-chemical (paints, plastics).
- The Heilongjiang Agriculture Product Processing Engineering and Technology Research Center was jointly set-up with the Canadian province of Alberta. The Center has 19 professors, and 10 visiting professors and researchers. They have four research centers and production equipment worth 10 million rmb. The Center is part of the KLJ Science and Technology Bureau's R&D team for food processing and advanced food processing technology. However, the Center can be enhanced to focus increasingly on advanced screening of food processing products, harnessing domestic and international knowledge and partners.

Human Resources

- Training for advance agriculture, food processing and bio-products needs to develop. But institutions are in place that can expand to meet needs. Daqing has successfully attracted August First Agriculture University from another Heilongjiang location. The University has education and training programs in food science, life science, plant and animal science and technology. In addition, the University has 10 provincial-level R&D centers, the Ministry of Agriculture Soybean Seed Quality Resource Improvement Center, the Bureau of Land Reclamation Agriculture Research Center. The University has 380 professors, 56 with PhD degrees, and it has achieved more than 300 research results. Currently, it is conducting more than 300 R&D projects, including 46 national-level projects.
- The August First Agriculture University is part of Heilongjiang's Science and Technology Bureau's mission to conduct research in the areas of new product varieties, high efficiency production, and application of bio-technology to agriculture products. Extending these training capabilities specifically into bio-products is a natural extension that will require harnessing provincial and local multidisciplinary research skills, as well as cooperation with international partners.

Finance

- Government intuitions have made financing for new businesses related to agriculture a priority and mechanisms are in place to finance some deals which are well qualified. However, the number of well qualified deals is limited. .
- Daqing Commercial Bank is currently financing companies in bio-products. For example, they recently made loans to companies that make ethanol from corn and process soy.
- The city-owned Daqing Commercial and Industrial Guarantee Company guarantees debt up to 40 million yuan for high-tech companies, including to the ethanol company mentioned above.

Land Use

- The soybean high-tech park provides government funded manufacturing space for the Riyuexin Soybean Company, and good land and facility use for soybean-related technology companies. The firms in the park are prepared to work with other companies at that site on collaborative R&D in new areas of soy product development.

Governance and Business Climate

- Daqing has developed and implemented permitting and regulatory procedures for enterprises that would apply to food processing and bio-products companies.

Transportation and Logistics

- Meeting logistical requirements of primary agriculture should not be more difficult than at present. However, having strong agricultural logistics capabilities, particularly cost effective trucking, is very important for value-added food processing and bio-products. Ability to compete with other regions will require cost effective logistics to get all products to market.

Power and Environment

- Daqing should be particularly well suited to utilize progressive renewable energy processes in the primary agriculture, value-added food processing and bio-products industries. All industry or technology park sites in Daqing could be adapted to provide a strong "eco-industrial" park capacity for value-added food or bio-product development and production where tenant companies can use the waste output of one another's processing activities as fuel or direct energy.

5.4. Prioritization of Diversification Opportunities

Sections 4 and 5 indicate that substantial opportunity exists in the Daqing-city region to diversify its economic structure. In some cases the diversification is an extension or modification of the "energy and chemical" industry that has been the hallmark of the Daqing-city region's economy. In others cases, there is potential for new business opportunities to leverage the core agricultural strength of the region. Both areas have challenges that must be addressed.

In order to help local decision-makers to prioritize among the many candidates for diversification, ICF proposes several criteria that can be used to rank clusters in terms of their economic potential. These are:

- Growth trends and predicted future growth of the cluster, both nationally and globally;
- The presence in Daqing of core industries that provide the industrial base for cluster diversification, the competitive strengths of those industries, and the overall depth of the cluster value chain;
- Predicted potential for upstream and downstream activities that can grow out of core industrial activities; and
- The potential positive economic impact for Daqing in relation to expected investment costs (high impact for low investment is optimal).

Table 24, illustrates ICF's preliminary ranking of Daqing's candidates for diversification

Table 24: Ranking of Diversification Candidates

Diversification Candidates	National Growth	Daqing Structural Base	Up-stream or Downstream Potential*	Impact/Investment Ratio	*Overall Candidate Rating*
Value-Added Food Processing	High	High	High	Medium	***High***
Bio-Fuels	High	Low	High	Medium	***High***
Petrochemicals & Intermediates	High	Medium	Medium	Medium	***High***
Natural Gas Extraction	High	Low	Medium	Medium	***Medium***
Shale Oil Extraction	High (crude oil demand)	Low	High	Low (initially)	***Medium***
Petroleum Refining	High	Low	Medium	Medium	***Medium***
Chemical Derivatives & Consumer Products	High	Low	Low	Medium	***Medium***
Primary Agriculture	Medium	High	Medium	Medium	***Medium***
Metal Fabrication & Machinery Equipment	*High*	*Low*	*Medium*	Medium	***Medium***
Crude Oil Extraction	Low	High	Low	Medium	***Medium***
Coal Extraction	Medium	Low	Medium	Low	***Low***

** Indicates the market potential, plus the ability of the Daqing region to meet the challenges.*

Overall, ICF feels that the clusters with the greatest economic potential are: bio-products development, petrochemicals, and value-added food processing. In addition to having strong growth trends and many possibilities for upstream and downstream diversification, they also have strong potential to generate local revenue compared with other clusters.

Other clusters, such as crude oil extraction, petroleum refining, and chemical derivatives, have high demand for the end product, but the potential for diversification is low. In the case of crude oil

extraction this is because production in Daqing is declining. In the case of chemical derivatives production, the competition is fierce, and Daqing has significant disadvantages in terns of distance from end markets and its cold climate, both of which increase costs. Thus, ICF considers these clusters as medium-priority candidates. Coal is given the lowest ranking due to high investment costs and partnership challenges. Shale extraction has interesting potential, but it is a long term candidate and would need both a provincial and national focus.

At this juncture, local authorities should embark on a thorough and collaborative strategy-making process in order to confirm and elaborate on these rankings, set priorities, and design initiatives to strengthen the critical inputs needed for both existing and emerging clusters. This process should involve all relevant economic stakeholders in the region, both public and private. ICF's recommendations for this cluster development process are outlined in the next section.

6. Conclusion: Collaborating to Diversify and Prosper

6.1. A Strong Platform for the Future

Daqing is fortunate to have strong industry assets and many positive economic input foundations that can enable the municipality to diversify. However, achieving diversification will not happen automatically. For diversification to take place the municipality needs to adopt a development framework that will ensure that existing clusters will expand upstream or downstream and that new industries will form or be attracted. Traditional economic development based on marketing land and incentives to target companies may generate some useful results. However, employing a cluster-based development strategy may yield even stronger results.

Based on the analysis and interviews conducted in Daqing and experience in other transforming economies, similar to Daqing, ICF believes that the municipality can benefit substantially by organizing and undertaking a bottom-up, market-focused, collaborative development strategy process for the Daqing metropolitan region. This strategy development process will enable the Daqing city region and its districts and technology parks to better understand existing industry capabilities and needs and to negotiate agreements on how to more effectively and actively work with one another to form, expand and attract industries in target industries—including those candidates already identified, but very likely, new industries identified by the Daqing region's existing and newly forming enterprises. (Note: ICF typically defines a region as a metropolitan area that includes the anchor municipality and the surrounding communities (often within a single county) encompassing a commuter-shed radius of roughly forty –five miles. In the case of Daqing, their region is the city and the surrounding districts, including the zones and subsidiary technology parks).

It is acknowledged that CNPC wields substantial influence in any future diversification strategies for this region. It could be argued that given this tremendous influence, the Daqing municipality has limited input in future directions. However, if the Daqing region were to undertake a bottom-up market-focused strategy for the region, this exercise would demonstrate to CNPC the validity of many of the diversification strategies. The process would clearly identify the structural issues facing the region and would also clearly outline steps that could be taken to create a more robust and sustainable economy. CNPC has made a substantial investment in this region and the results of a collaborative strategy development process would identify ways in which this investment could be protected in the future.

By undertaking a collaborative cluster strategy process Daqing will discover not only what is needed to enable and speed up diversification and negotiate agreements to provide what is needed; Daqing will also be able to create a new regional partnership that can work together on an ongoing basis to identify and solve economic development problems, industry by industry as well as on a cross-regional basis. This approach to economic diversification fosters regional ability to learn and change as market demand shifts. This approach will also enable the Daqing region to more effectively make the case for investment, policy and program needs at the provincial level, as part of the Ha-Da-Qi Corridor.

As stated in the introductory chapter, a high performing economy is able to create economic input advantages for each industry cluster as they move through their development life cycle. A high performing economy naturally diversifies, with their existing companies expanding and adapting, with new specialized suppliers and new start-ups taking shape and larger firms being

attracted. This is possible because in high performing regions companies understand market demand and effectively communicate their shared needs to suppliers and input institutions. Those institutions, in turn, are motivated and able to respond to industry needs, creating a positive feedback loop or "vital cycle." If this is true, then Daqing municipality can use the cluster-based regional strategy approach to create a new supporting infrastructure for improved market dynamics that will grow the Daqing region's own vital cycle over time.

6.2. Enabling Diversification: A Daqing Cluster-based Collaborative Strategy

Daqing must undertake near-term and longer-term planning as a normal feature of its municipal economic development. The cluster-based strategy process is an activity that is less about planning than it is about accelerating learning, agreement, and change by the economy itself. There are four phases in the cluster-based collaborative strategy process, followed by ongoing implementation, which can be used by Daqing to make progress and sustain action for economic diversification. These steps can help build up new clusters from those candidates identified in this report, but also assist diversification through an intensive collaborative strategy process with existing and new industries working with local and provincial institutions. The recommended steps are as follows:

- **Phase I. Mobilize—Engage and Prepare Regional Stakeholders**: Communicate with regional industry and economic institutions to ready them to work together in a cluster-based collaborative strategy. Form a "stewardship" group (similar to a board of directors) that consists of regional "servant-leaders" who will motivate stakeholders to participate. Establish a communications plan for the strategy initiative. Finalize a schedule for the strategy process. Hold a regional launch event or forum to let industry and institutional leaders know that they are invited to participate and help define actions for their economic future.
- **Phase II. Analyze—Complete a Baseline Diagnosis of the Daqing Economy**: Conduct three levels of analysis on a comparative basis with competing regions. The three levels include: 1. overall economic performance outcomes, including: prosperity, disparity, sustainability and quality of life; 2. identification and analysis of clusters, their structure, stage of life cycle and competitive position; and 3. assessment of each category of economic input foundation and comparative strengths and weaknesses (e.g., human resources, innovation, finance, logistics, resources, governance, quality of life, marketing). These can build from annual statistics but must include surveys and interviews with industries and institutions. Complete a diagnostic report that shows relative position of Daqing. Hold a second regional forum to share the diagnosis and to stimulate participation in the strategy process.
- **Phase III. Catalyze—Develop Regional Cluster Strategies and Cross-cutting Initiatives**: Organize value-chain based working groups for existing as well as emerging clusters. These working groups must include existing producers, suppliers as well as local and provincial economic input institutions, such as secondary schools, colleges and universities, transportation agencies and providers, energy, water and sewerage agencies, tax and regulatory agencies and marketing resources. Each cluster group will have their own characteristics. In Daqing, for example, energy-related clusters will need to have representatives from national industry agencies, such as CNPC and SINOPEC and others. International and domestic industries from outside the Daqing region can also be invited to participate. Each cluster working groups may consist of two co-chairs and from 25 to 75 business, government, and institutional participants. The cluster working group process consists of four developmental steps:

- *Round 1. Identify Shared Competitive Challenges*: Examine diagnosis of cluster, identify priority development challenges for enterprise formation, expansion, and attraction on which participants are willing to work with other firms and institutions.
- *Round 2. Define Priority Development Actions*: Review best practices from global sources and propose actions to overcome development challenges to be worked on with participating firms and institutions that will form business planning teams.
- *Round 3. Prepare Collaborative Action-Business Plans*: Collaborative action teams dedicated to creating solutions to the priority challenges are facilitated to prepare business plans that specify public or private roles, resources and timing for action implementation. A given cluster working group might complete five to seven action-business plans for their cluster development strategy. These are reviewed by cluster participants and signed-off on as the core strategy components.
- *Round 4. Complete Cluster Strategy and Implementation Agreements*: Cluster participants review their challenges, agreed upon actions, action-business plans and agree on a 3-to-5 year development "vision" for their efforts. Cluster participants then are assisted in negotiating an agreement on how to sustain implementation of their strategy. This may be through an existing organization, such as an expanded association, or through a newly established cluster entity with membership from existing and new participants.

After each of the rounds, described above, the co-chairs of each cluster will meet jointly with the "stewardship group" created to oversee and guide the regional cluster-based economic development process. The purpose of these sessions is to define municipal region-wide needs and actions to improve the overall economy. Three rounds of collaborative strategy are carried out, each one occurring just after each of the clusters sessions. The first stewardship session identifies shared regional challenges from across all the clusters. The second session identifies similarities in actions proposed, and brings together delegates from across the clusters to combine thinking on a regional initiative. During the third session the stewards agree to anchor or champion each of the cross-cutting, region-wide, initiatives with a team from across clusters. These cross-cutting initiatives often referred to as "flagships," become an important outcome of the cluster-based strategy process. The importance of "flagships" developed in this manner is that they each have a strong industry and institutional constituency and constitute an economic lobby, not an industrial lobby.

- **Phase IV. Realize—Build Daqing Region Implementation Entity and Launch Action**: Once the bottom-up, collaborative strategy process has been carried out, the cluster co-chairs and the "stewards" need to agree upon how best to organize to sustain implementation of the actions the collaborative has developed. This requires several steps during which "stewards" and cluster co-chairs are helped to examine organizational alternatives and negotiate agreements on the mission, structure, and operations of a new regional partnership entity. Such an entity may be constructed out of an existing regional organization or it could be attached to an existing municipal economic development entity in Daqing. There is no need to replace or compete with existing economic development entities, only to ensure that there is strong collaboration and alignment of public and private resources for action. The importance of this organization is that its structure should resemble an economic congress with delegations from each of the Daqing municipal region's clusters as well as teams representing all of the region's economic input institutions. By "convening the marketplace" in this balanced manner the cluster strategies can receive direct attention and assistance from all key industries and institutions that can and should be able to work with them. Likewise, the cross-cutting "flagship" initiatives can receive support from across all clusters to build and support

the policies, programs, and practices they require. When the organizational business plan for the Daqing regional partnership is completed, an integrated strategy can be completed. The strategy will have these components: 1. The Daqing economy today and its overall performance and structure; 2. Daqing Economic Engines: Each cluster strategy comprising current structure and competitiveness, priority challenges, agreed upon actions and implementation strategy; 3. Daqing Economic Advantages: Analysis of economic input foundation, capacity and agreed upon "flagship" initiatives. 4. Building the Next Generation Daqing Economy: Presentation of the overarching regional partnership implementation mechanism agreed to and how it will sustain cluster actions, "flagship" development, as well as track Daqing's overall outcomes, cluster performance

- **Phase V. Actualize—Carrying Out Cluster Actions and Regional Flagships**: Once the preceding four phases of development have been completed (which usually requires nine to twelve months), the actual operations of economic diversification and growth initiatives can take place. Once a regional implementation partnership is launched formally, it will convene its cluster and foundation delegations quarterly to track progress on cluster actions and "flagship" initiatives. The partnership entity, ideally, should have a budget that includes a regional competitiveness fund that can provide matching grants to cluster diversification and development initiatives that have been agreed upon in each cluster strategy or support the coordination and operations of a region-wide "flagship" initiative that might focus on workforce, innovation, finance, logistics or other cross-cutting economic input foundation themes in the overall regional strategy. By meeting quarterly, financing matching grants and tracking efforts to ensure public and private collaborative initiatives are moving forward, the regional partnership can serve as the catalytic agent as well as manager of a continuing flow of diversification and development actions that will improve overall economic performance in Daqing. The progress made can be reported to the region and the members of the partnership quarterly with an annual or bi-annual overall assessment of progress that can also be shared with the public and used in marketing Daqing globally.

6.3 Afterthought: Working within Realities

There are many diversification opportunities available for Daqing to develop. However there are significant challenges that must be overcome before the Daqing region can realize the full potential of these opportunities. The collaborative strategy process, if effectively carried out, can alleviate many of these challenges. Building a readiness to collaborate is the key point of departure for shaping Daqing's future:

- **Districts, Zones and Technology Park Partnership**: Daqing municipality is a complex metropolitan economy. The municipality and its surrounding districts, zones and technology parks all have much to gain from strengthening their existing planning and development efforts. These efforts can be further reinforced by ensuring that each district, zone and park join in crafting the overall Daqing region economic strategy. Their existing industries as well as infrastructure need to be viewed as part of a regional portfolio that can is market-driven with distinctive advantages matched to each cluster's needs. This is a natural point of departure for future diversification efforts.
- **Provincial Partnership**: The Daqing region has geographical, logistical, and institutional issues to overcome which will require strong provincial and local collaboration in order to prioritize needs and agree on strategic improvements. The Ha-Da-Qi Corridor initiative and commitments of the Province to transform and grow the economy should bring strong provincial ministry partnerships to regional diversification efforts. By working from the bottom-up, with provincial

partners at the table, Daqing should be able to build a strong economic case from the regional to the provincial level of decision-making. Daqing should work hard to develop a shared understanding with Provincial partners that building economic strategy up from the regional level to the provincial level makes sense. The conditions are good for this to take place.

- **National Partnership**: Many diversification opportunities will require, at some stage, commitments and active participation of national agencies. The collaboration of CNPC and other national entities is essential to effective diversification. The primary goal for Daqing will be to convince national government entities, including the Development and Reform Commission and other agencies that have a clear mandate to reinvigorate old industrial complex regions, to recognize the economic potential of the Daqing region. Heilongjiang Province should be a strong partner in this effort. Through an effective collaborative strategy process CNPC and the central government should be assisted to recognize and then "buy into" the strengths of the region as base for diversification of the continuum of energy related clusters. If CNPC and the central government can recognize that the Daqing region has assets (e.g., refineries, natural gas, shale, agricultural capacity, an so forth) that are not being fully utilized and that strategic new investment in needed infrastructure (e.g., constructing roads, pipelines, and rail expansions) can protect their current investments and pave the way for future development in the region, then Daqing's development opportunities can be realized.

The Daqing region has key economic assets, creating new value-from them will require more than traditional plans. A cohesive collaborative strategy will be required to take advantage of these assets by harnessing existing regional assets in new ways. This in turn will create the seeds of an economic "vital cycle" that will help attract and grow industries for Daqing's future.

8. Daqing Marketing Strategy

By James Gollub, ICF International[106]

1. Objectives

The objective of this report is to provide Daqing with an outline and overview of how to build a marketing and investment promotion plan. Generally, all effective regional marketing and investment promotion plans are grounded in solid research, position a community to take advantage of its competitive strengths, are aimed at strategic industry targets, and focus on specific geographic markets.

To this end, the report incorporates the fundamentals of the ICF Cluster Framework—which provides a comprehensive process of identifying relevant municipal data and focusing on the competitiveness of the existing Daqing 'cluster portfolio' that makes up the Daqing city-region economy. The primary clusters that are the economic drivers in the Daqing region are energy, chemicals, agriculture and bio-industry—and a major supporting industry impacting each of these clusters, heavy machinery—including equipment, fabrication, and materials.

Developing an effective investment marketing and promotion strategy is a bottom-up, community driven process that should reflect the unique characteristics and "competitive advantages" of the city-region of Daqing. A fundamental challenge for Daqing (or for any municipality) is to competitively differentiate from other regions and demonstrate the advantages of doing business in Daqing relative to other competitive locations. Typically, competitive locations are identified by conducting a comprehensive analysis based on a combination of demand (e.g., customer), industrial supply, and geographic distribution factors. In the case of Daqing, competitive locations include, but are not limited to Dalian (manufacturing); Xinjiang Province, including the cities of Urumqi (oil and gas) and Karamay (oil and gas and, in particular, the impact of a new pipeline from Kazakhstan); Qingdao (manufacturing); and Shengli (oil and gas). Competitive locations are not constrained by jurisdictional or political boundaries. Increasingly, due to the impact of global markets, the competitive location quotient for municipal regions crosses international borders. This positioning exercise requires extensive mobilization, diagnosis, consultation, and collaborative efforts, which are integral components of the ICF Cluster Framework and are elaborated on in subsequent sections of this report.

In addition to utilizing a cluster framework approach as the platform to building an overall municipal marketing program, this section also incorporates ICF's three-level marketing framework which can be used by municipalities to systematically enhance their marketing outreach to build relationships with and attract target industries. We call this the M-Cycle—comprised of *Market*, *Message,* and *Medium*. In addition to providing the fundamental building blocks of how to develop a marketing plan, this report also provides an overview of marketing strategy components (marketing techniques) and a current appraisal of Daqing's regional economic input advantages. Finally, the report provides a short discussion on the collaborative capacity required to bring to fruition a city-region marketing program and some examples of 'best practices' in on-line marketing and investment promotion (emphasizing successful web-marketing initiatives in selected regions).

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2. Assessment of Daqing's Current Marketing Efforts

In order to gain insight into the strategies and successes Daqing has achieved in its marketing efforts, several interviews were conducted with relevant agencies. Through these interview sessions, ICF determined this report will provide: a) guidance on ways to strengthen the image of Daqing in order to attract investment, b) examples of the competitive advantages Daqing can incorporate into their marketing efforts and c) advice on how Daqing can develop a marketing and investment promotion plan. Specifically, Daqing officials indicated they would like this overview to provide guidance on identifying *markets*, on the types of marketing techniques or *medium(s)* that the City of Daqing needs to develop (e.g., web, print, site selection packages), and general advice on the high level content, or *message* that materials should incorporate. Finally, the client indicated they would like to know more about how the site selector process works and how a municipality should be prepared to work with site selectors.

This report provides information about investment marketing practices and the processes involved in the design of an integrated marketing program. The report uses a cluster approach to demonstrate how markets should be identified, which types of marketing tools have been proven most effective, and how messaging should be aligned with cluster strengths and economic foundation assets. Finally, the report addresses the topic of site selectors and efforts required by a municipality to effectively respond to site selectors.

2.1 Current Marketing Efforts

Through the interview process it was determined that, to date, the City of Daqing's core activities in their marketing and investment promotion program encompasses a brand positioning initiative and several outreach strategies:

- **Brand Positioning Statement:** From a brand perspective the City Promotion and Propaganda Office provided the ICF team with an introduction and explanation of their new brand positioning statement (2005) which is *"Capital of Green Petro Chemical and City of 100 Lakes."* This brand positioning statement is meant to reflect the environmental achievements of the City of Daqing and is based on the 2001 SEPA award from the State Environmental Protection Agency recognizing Daqing as one of the first municipalities to receive the central government's approval of the national level of Environmental standards. Other factors considered in the adoption of this brand positioning statement were petroleum industry, education, agriculture, and environmental qualities of the Daqing city-region.

  The Daqing city-region should be commended for their work in developing a brand positioning statement. Successful brand positioning is an exercise that evolves over time and Daqing's efforts put in motion an overall strategic direction. However, there are still significant challenges to overcome in this area. For instance, the brand positioning statement (*"Capital of Green Petro Chemical and City of 100 Lakes")* is in itself a somewhat inconsistent message that presents an incongruent and contradictory message because, as the saying goes, "oil and water do not mix." The primary brand positioning statement should focus on Daqing's greatest competitive advantages, and reflect the image needs of local industry. (This issue is discussed in greater detail in a subsequent section). This statement is also not captured on the website and the content that is presented was last updated in 2004 and is not presented in a "marketing-oriented format.

- **Foreign Offices**: The municipality (through the efforts of Daqing Foreign Affairs is also involved in international marketing focusing on the main markets of Hong Kong, Taiwan and Macau. The foreign affairs offices are in Calgary, Toronto, Houston, Chicago, Sidney, Tokyo, and Seoul. They also have Senior Economic Advisory situated in major target market locations.
- **Sister-City Twinning Relationships**: The City of Daqing has several "sister-city twinning relationships," including Calgary (the first), as well as with cities in Russia, Ukraine, Australia and Korea. The City also has several economic and trade partnerships with Russian cities and Singapore.
- **Ex-Pat Strategies**: Engaging former Daqing citizens living in other parts of the world. There is an estimated 20,000 young people from Daqing living abroad who have been targeted relative to the development of the High-Tech Development Park in Daqing. To date, this program has resulted in approximately 70 overseas Chinese developing 40 new enterprises in the park.
- **Relationships with Central Government**: The Bureau has a program to strengthen relationships with Chinese central ministries, particularly Ministry of Foreign Affairs, to increase the visibility of Daqing. Daqing officials invite central government officials to come to Daqing and provide tours and interpretive visits to these officials, highlighting the strengths and assets of Daqing as a city and region. For example the Chinese Ambassador to Saudi Arabia visited Daqing and was given a comprehensive briefing on Daqing. Since then Daqing has established a branch office in Saudi Arabia.

2.2 Challenges Facing Daqing Marketing Efforts

Throughout the interview process, three main challenges were identified as factors affecting Daqing's current marketing and investment promotion efforts. The following outlines these challenges and with strategic recommendations on how they can be overcome.

- **Strengthening Visibility**: It is acknowledged that the city has 'relatively' good visibility domestically, but on the international stage Daqing is not recognized, except in select markets as an oil and gas capital (Interview: Daqing Investment and Promotion Bureau). In addition, the City of Daqing officials responsible for marketing and investment promotion acknowledge their materials are not 'up to international standards' nor do they present a consistent image or message across markets and audiences (Interview: Daqing Investment and Promotion Bureau). *The City of Daqing needs to continue to evolve its "vision for the city by defining unique elements and competitive advantages, clearly articulate these advantages, ensure they are aligned with their brand positioning statement and incorporate this in their international corporate marketing efforts.*
- **Coordinated Planning**: Marketing needs to be both strategic and reactive. Daqing does not have a long-term plan that coordinates all the different agencies engaged in promotion. The City's marketing is reactive, which is very common across regions,—they hand out materials at conferences and events, but do not have a strategic plan for evolving the City's image, target audiences and marketing goals (Interview: Daqing Investment and Promotion Bureau). *The City of Daqing needs to develop a proactive, coordinated marketing/promotion strategy that lays out a coordinated strategy for the different agencies over a specific period of time with specific measurable targets and results.* The identification of target audiences (e.g., target markets) and regional marketing goals must be based on a collaborative cluster process designed to solicit focused input from all stakeholders (e.g., government, industry, and academia). A bottom-up consultative process is the only way in which a region will be able to identify and agree on shared marketing goals and target markets.

- **International Investment Attraction**: In spite of its assets, Daqing needs help 'productizing' and marketing itself, especially internationally. Daqing is in need of marketing professionals, and is forced to look internationally for such expertise. Daqing municipal officials plan on hiring an international management consulting firm to guide the city's marketing efforts (Interview: Daqing Investment and Promotion Bureau). Similarly, Daqing companies need help identifying and marketing to international investors. There is a shortage of marketing professionals in the region, and this is a widely-cited need by companies (Interview #26: National High-Tech Park). International marketing and exporting is a challenge since the main client of Daqing's companies is CNPC. Exporting Daqing's products remains a challenge, since Daqing's technologies and services follow its main client, CNPC and international markets are limited to CNPC's overseas activities. *The Ha-Da-Qi Corridor Plan is the region's key strategy for foreign investment and so Daqing should develop a collaborative and complementary approach—utilizing the identified strengths and assets of the Corridor and leveraging the resources, materials and activities of the Ha-Da-Qi Corridor marketing efforts.*

Despite the progress that has been made in Daqing, the municipality realizes they have significant challenges in the area of marketing and investment promotion strategy. Daqing must move in several directions to boost prosperity and diversification efforts through the implementation of a long-term marketing and investment promotion strategy. Specifically, Daqing must support an environment that will foster differentiated high-value industry creation, they must combine their recruiting efforts with a commitment to build robust clusters, and they must move from government led development to public/private collaboration.

A focused marketing and investment promotion plan can help to enable Daqing to achieve these goals. Any marketing plan that Daqing undertakes must:

- Bring together relevant stakeholders (industry, academia, and the various government agencies with responsibility for marketing) to collaborate in developing a shared marketing strategy for Daqing;
- Assess the competitive position of Daqing and of the selected industry clusters in the city-region and help to 'productize' the region;
- Identify key challenges opportunities and new strategic directions for Daqing, as well as for the selected clusters;
- Promote consensus on a long-term economic and strategic marketing and action agenda for Daqing so that activities can be proactive and sustained over time.

3. Use the Cluster Framework to Guide Regional Marketing Efforts

3.1 Think Regionally to Compete Globally

Geographic regions, not political jurisdictions define where economic development takes place. Economies are indifferent to administrative boundaries but are concerned with securing economic input advantages. For this reason, throughout history, geographic regions have been where economic agglomeration has taken place. Silicon Valley is not a jurisdiction; it is a region across which economic transactions take place. The region has over nine cities and four counties. Similarly, the Tri-State region surrounding New York City is not a unified administrative area but a regional economy. What defines a metropolitan region is the distance that a workforce can travel to work. Typically, this means that the center of any region has a radius of roughly 100 kilometers.

Regions can certainly overlap with one another and therefore constitute a mega-region that may actually consist of a series of regional hubs or growth poles that draw from overlapping labor markets. The key to the definition of a region or mega-region is contiguity and sharing of common inputs. As we will see, leading regions have their own distinctive economic features but often share common infrastructure with one another, particularly in mega-regions.

A group of rural or small communities can also constitute a region, if they share workforce and other key sources of economic infrastructure, whether that is power, water, education and training, or transportation. Rural areas can benefit substantially from adopting a regional perspective that enables them to better understand and serve broader economic markets together.

Metropolitan areas, too, need to help rural outlying communities become part of growing regional markets, rather than excluding them. Rural areas can become satellites or nodes of economic activity that are aligned with metro areas, or with one another.

Thinking regionally is essential for competitiveness as the region is a geographic unit that is important to industry. Working from a regional unit of analysis permits productive thinking and organization with respect to building economic competitiveness. Thinking about jurisdictions, alone, however, leads to non-productive, futile competitiveness. Regional thinking emphasizes actions that reach across jurisdictions to find common interests that will benefit everyone.

3.2 Focus on Clusters

The previous generation of economic development has emphasized the recruitment of industry factories to a region to create jobs. This is an understandable interest among municipalities, districts, or counties that are mandated to increase their contribution to GDP. However, analysis of successful regions over time has shown they have been able to form, expand, and attract groupings of companies and suppliers that are called clusters. These clusters are agglomerations of firms that produce and ship similar products or services to the same or different external domestic or national market segments. Clusters are characterized by their use of similar technologies, skills, types of financing, and logistical infrastructure. Clusters also include suppliers that have followed the producer companies or formed locally and understand their business needs. Further, regions with clusters have public and private institutions that provide inputs of skills, innovation, finance, and infrastructure that create a distinctive economic advantage for these producers and their suppliers.

What distinguishes clusters as an economic unit of analysis from traditional industry, more generally, is the competitive power these agglomerations exert both on global markets and on the regional economy. With regard to global market competitiveness, the concentration of related industry in a region leads to a faster pace of innovation and rapid adjustment to market demand. This happens with microelectronics and telecommunications in the Silicon Valley; with film and television in Los Angeles; and with financial services in New York. Proximity resulting from agglomeration leads to a competitive exchange of workforce, innovation, and supporting business knowledge. This becomes even stronger as regional education, research, finance and logistics institutions become attuned to industry needs. This is called a positive feedback loop, as growth in outputs enables and stimulates growth in economic inputs.

From the standpoint of the metro-region, clusters are important because they generate higher economic inputs than efforts focused on any one company or industry. Clusters create primary employment as well as secondary and tertiary employment in a region. For this reason, typical

clusters rarely create more than 25% of total employment but generate a great deal of balance. It is this economic multiplier effect that makes the development of clusters attractive to provinces, states, and municipalities. However, fostering the formation, expansion, and attraction of clusters is not the same thing as simply attracting and co-locating factories in an industrial park. Clusters are far more than that. Understanding what clusters are and how they form, grow, and exert their impact on the economy requires a way of thinking that focuses on building the "value-chain" for each cluster—producer segments, suppliers, and specialized economic inputs. As clusters develop they become engines of the economy, creating diversity by virtue of the different segments served by cluster companies. They also create the capacity to adapt to markets, which a region having only individual plants may not achieve as easily, particularly if those plants are branch plants.

Clusters are regional in nature, but can have strong linkages with suppliers outside the immediate region, often with satellite areas. Further, provinces may have similar clusters across regions, each slightly different, which contribute to overall provincial GDP. Clusters do not have to be completely concentrated in one metro-region. Many regions may have their own distinctive clusters, serving different segments or utilizing different regional advantages. However, clusters that do not derive competitive advantages from the region where they are located will either not remain there or will decline over time. Therefore, metro-regions should not emulate one another's cluster development patterns unless there are strong sources of advantage that are clearly attracting industry operations.

3.3 Develop Economic Input Advantages

Clusters only take shape and grow in regions where they derive specific competitive advantages. Industrial branch plants, too, will locate in regions or zones where there are financial incentives (low taxes, affordable land, low cost labor, natural resources). However, they may not grow into clusters. The reason for this is that branch plants often serve only a narrowly defined production or assembly objective, have few regional suppliers, and have low levels of economic interdependence with the immediately surrounding region. Clusters, however, follow a more organic development path. They tend to grow in a region because of a distinctive set of economic input advantages. These may be natural resources, as in the case of Daqing's oil and gas reserves. But very often these advantages come from "man made' sources, such as spin-offs from existing companies, start-ups by entrepreneurs, or incoming firms. These seeds of clusters take shape in the region because their founders or managers value distinctive regional resources, whether skills, innovation, financing, infrastructure, governance, or quality of life.

High performing regions have a history of providing industry clusters with multiple advantages in economic inputs they need, changing and improving these inputs over time. What is crucial to a region's economic development and to a province's gross domestic product growth is to understand and align advantages across all public and private sources of economic input and each regional cluster, as they develop and move through their industry life cycle.

There are eight types of economic input foundations (e.g., "building blocks") that regions can create, shape, and improve. These regional inputs may, in fact, include those operated by federal, provincial, or municipal agencies as well as private and non-governmental institutions. When examined together each of these input foundations are provider systems, not just single agencies, policies, or programs. They encompass:

1. ***Human Resources System*:** The education and training institutions and programs that ready workers at the basic skill level (preparation), train professional and technical skills (advancement) and upgrade worker capabilities over time (renewal) as required by each cluster.
2. ***Innovation System*:** The range of providers of basic and applied research (discovery), technology creation and product design (development), and delivery of practice products and practices to the marketplace (deployment) for each cluster.
3. ***Finance System*:** The sources of early stage capital for proof-of-concept and prototype development (initiation), angel and venture stage financing for scale-up of production (expansion), and financing for restructuring of industry (modernization).
4. ***Infrastructure Systems*:** The continuum of physical infrastructure for logistics, such as highways, rail, airports, ports, pipeline (mobility), capacity to provide energy, waste disposal and treatment, and water (operations), and sites where different clusters can productively grow, whether raw land, re-use of existing sites or industry or technology parks (facilities).
5. **Information Systems:** The availability of land lines, wireless, and satellite based communications services (modes), access to the speed of services needed for global operations (bandwidth), and presence of computer and internet providers to support regional cluster activities (services).
6. ***Governance Systems***: Levels of business taxation relative to delivery of quality public services (return on taxation), efficiency and consistency of permitting (regulation), and customer-focused and quality orientation of publicly managed transactions (administration).
7. ***Marketing Systems***: The existence in the region of expertise in shaping goods and services for target markets (productization), the presence of providers able to link regional firms to national and international sales channels (distribution), and capacity to build the image of the region and its clusters relative to competitors in global markets (branding).
8. ***Quality of Life Systems***: Ability to provide workforce at all levels with affordable choices among places to live (housing), access to responsive, high-quality medicine (health care), and a rich and diverse array of cultural opportunities (recreation).

The quality and responsiveness of each of these economic input foundations will vary across regions in a province. Regions that are able to improve these inputs relative to the needs of existing and emerging industry clusters will have taken the most important step towards improving regional economic development. Measuring the capacity and responsiveness of economic input foundations is not easy. Each system of economic inputs can be measured quantitatively and qualitatively in terms of the inputs used or received as well as outputs generated. Purely quantitative statistics, such as the number of engineering graduates, or research and development expenditures, for example, do not necessarily measure the appropriateness and productivity or value of outputs, nor their match to regional cluster needs. For this reason, regions need to explore how to assess the competencies, capacity, and responsiveness of regional economic inputs in order to build effective competitiveness strategies.

3.4 Build Advantages through Collaborative Solutions

This discussion has made three key points based on wide experience of high performing economies: First, metro-regions should be the focus of competitiveness development for a province and for its corridor. Second, the formation and development of a portfolio of industry clusters should be the focus of each region—the engines of the economy. Third, these cluster 'engines' will grow and run best when they have advantages in specific economic inputs. These three points lead to a fourth and final point which is—it is through collaboration that these points can be best implemented. In fact, high performing economies are characterized by a high degree of collaboration of many forms:

- ***Business to Business*:** Pre-competitive R&D consortia, joint ventures for production and supply-chain finance, and marketing alliances.
- ***Business to Institution*:** Firms working with colleges and universities on curriculum, with laboratories and research institutes on R&D, with power generators, and regional logistics centers (ports, airports).
- ***Institution to Institution*:** Colleges and universities working on training and R&D and partnering in new institutions, commercialization finance, and technology parks.

These and other forms of collaboration are natural to market economies and their vitality is indicative of the economic strength and potential of a region.

Perhaps just as important is the capacity of a region to create new collaborative organizations that catalyze, mediate, and manage regional collaboration. This means:

- ***Mobilize—Prepare to Build a Collaborative Process*:** The ability of a municipality to work with its districts and county and their industry and technology parks, industries as well as all economic input foundation providers—public and private—to organize a collaborative economic development strategy process. This would not be a study, but an actual joint process to use existing resources in new ways as well as define agreed upon new policies, programs, and practices.
- ***Analyze—Prepare a Baseline Comparative Assessment*:** The ability of the region to analyze its overall economic performance, the competitive structure and position of each cluster, and to appraise the strengths and weaknesses of each set of economic input foundations and their responsiveness to clusters.
- ***Catalyze—Convene Cluster Working Groups*:** The ability of a interim regional collaborative working group to organize and bring together each existing or emerging industry cluster in a region to work on defining shared competitiveness challenges, to identify agreed upon actions, and to develop collaborative action-business plans for cluster-specific actions -- all building up to a set of cluster specific strategies for the region.
- ***Realize—Building Regional Partnerships*:** The ability of the provincial, municipal district, and county members, the regional collaborative, and representatives from its clusters to define cross-cutting challenges for the overall region and to form a new or modified regional partnership structure. The ability for this partnership to permit regional stakeholders to work with each other to implement the solutions they have developed, across jurisdictional boundaries, across industries, and across public and private economic input foundation providers.

3.5 Use Clusters to Frame Regional Marketing Efforts

The ICF marketing framework utilizes the **M-Cycle** in marketing and investment promotion strategy. The framework first focuses on understanding markets using analytic techniques to understand industry targets. This framework strives to bring together the output side of an

industry or market with the critical input side of the economy to shape competitive programs for marketing and investment promotion and strategy. Secondly, the framework incorporates the development of the message through a process of interpreting market information to shape strategy for design and development of marketing and promotion actions for a regional economy. Third, the framework utilizes mediums (e.g., relevant industry tactics, like websites, site selection packages, etc.) to get the right message to the target audience—whether the audience is local, regional, or global.

The framework is compatible with ICF's broader approach to economic innovation and regional competitiveness strategy which is based on the four rules of successful economies

- **Think Regionally:** Marketing and investment attraction efforts have a greater chance of succeeding in regions that can best supply the economic inputs firms need to be competitive, such as skilled labor, technological innovation, and access to financing.
- **Focus on Clusters:** Daqing has both existing and emerging clusters that need to enhance their product innovation, production efficiency, and marketing effectiveness to grow. Success in competitiveness will result in greater diversity and deeper value-chain development for each cluster in the Daqing region. In the case of Daqing, the network of related and supporting industries lacks specialized suppliers. Investment attraction focuses efforts on bringing large external operations to the region, and the result of this is that small to medium-sized firms receive less attention and gain few benefits.
- **Create Advantage:** In Daqing, traditionally, government and economic development organizations have focused their efforts on recruiting large manufacturing and heavy industry operations, rather than upgrading the foundation assets and industries already in place within the city-region.
- **Work collaboratively**: Prosperous regions are able to develop a collaborative culture. Collaboration between businesses and between businesses and institutions will maximize the region's capability to create economic advantages for clusters. In the case of marketing and promotion strategy—collaborative capacity of government and institutions is a critical driver of business attraction. Governments, learning institutions, and other formal and informal organizations that facilitate the exchange of information and provide business coordinating functions can improve the business environment. These institutions are effective vehicles through which all companies can improve their business performance. Only through building the collaborative capacity within a region will marketing and promotion efforts be successful in the long-term.

4. Recommendations for Daqing's Marketing Strategy

4.1 Determine Regional Cluster Composition and Develop Regional Profile

A competitive cluster analysis is a complex exercise, generally performed by professional consultants. ICF is a recognized leader in this field and has undertaken comprehensive regional cluster analyses in many regions of the world. The analysis provided in the previous section of Daqing's current cluster portfolio is a point of departure for the Daqing city-region to better understand its cluster competitiveness and the state of health of its regional assets; however, *Task Two: Daqing Diversification Strategies* of this assignment does not represent a full-blown cluster competitiveness strategy (which typically includes the previous four phases of activity: *mobilization*, *diagnosis*, *collaboration*, and *implementation.* These phases engage all metropolitan stakeholders within a community over a sustained period of time). Various methodologies may be utilized in order to better understand a region's competitive strengths,

however in successful community profiling, all analytic work must be supplanted with information obtained through an extensive community consultation process.

The integration of this information (analysis and thorough community consultation through a collaborative cluster process) provides the foundation for a cluster-based strategy leading to an effective investment marketing program for the region (or municipality). ICF typically defines a region as a metropolitan area that includes the anchor municipality and the surrounding communities (often within a single county) encompassing a commuter-shed radius of roughly forty –five miles. In the case of Daqing, their region is the city and the surrounding districts, including the zones and subsidiary technology parks. The research undertaken for the competitive cluster analysis also provides the basis for a comprehensive *Regional Profile*, which is an essential component of any community-marketing and investment program. The information contained in a regional profile is not only a valuable research tool (for strategic planning and target marketing), but the compilation of the various hard and soft information in that Regional Profile represents the essential '*product*' of the economic development organization or lead agency responsible for the marketing and promotion strategy. Therefore, it cannot be emphasized enough that comprehensive research on the host city/region is critical before launching a marketing and investment promotion program.

4.2 Develop Marketing Plan

Step One: Utilize Results of Regional Profile

Once the Competitiveness Cluster Analysis and Regional Profile are completed the municipality/region can then begin to identify competitive strengths and opportunities and prepare a marketing plan profile, encompassing all data of interest, for investors and developers and individual companies. The work that ICF has undertaken in Task Two of this assignment contributes a solid starting point for that exercise. However, the City of Daqing must complement this work with additional specificity for investment and attraction purposes (e.g., following a step-by-step process to identify specific information that investors, brokers, and site selectors focus requests on). For example, site selectors (or their brokers) and investors typically inquire about available lands and buildings for sale or lease, labor market and business costs factors, the availability of suitable property, the relevant costs and infrastructure elements within the region, incentive packages, availability of specific human resources within the region, etc. In some instances, a community may be asked to respond to a detailed survey questionnaire by a site selection consultant acting on behalf of a multi-national client searching for a new “green field” location for a major production facility. This process is designed to narrow the field of prospective locations by eliminating those which do not meet all the company’s requirements. Note: If Daqing proceeds no further than this step, it will have developed the capacity to respond more effectively to investment inquiries.

Step Two: Select Specific Target Industries

Target specific industry sectors based on an analysis of the community's competitive strengths (Identified in Step One):

- Targeting is a critical step in an investment marketing program. A focused marketing program will target those industries or business sectors that are naturally attracted by the economic foundation strengths of the city-region, its location, local economic base, and infrastructure. Targets are developed as a result of the competitive cluster analysis, individual cluster strategies, and the marketing strategy.

- The ICF framework and process examines the industries for which Daqing economic foundations are best matched and for which Daqing provides the best access to end customers (this is not always easy). Growth industries are examined, as are industries or industry segments and supply chains where: 1) there is a match to Daqing's economic foundation capacity and 2) these industries are growing rapidly in China. Finally, within the target industries and supply chain framework, identified in the previous steps, leading companies that show the fastest growth and expansion, particularly in China are identified and targeted for investment attraction follow-up.

Step Three: Select Target Geographic Markets

Select geographic markets where those industry targets are located.

- **Economic Agency Agreement**: Once targeted industries have been identified through the matching process outlined above, all relevant economic development agencies must agree that these are the industry targets that the metropolitan region will pursue. Often city-regions must align their industry targets with provincial marketing and investment attraction efforts in order to maximize the effectiveness of joint and collaborative marketing programs. In the case of Daqing, this is clearly the case.

  The marketing goals for the HDQ Corridor must be aligned with the goals of the Daqing city-region in order to achieve maximum effectiveness. Often obtaining this agreement is in itself a difficult process. For instance, in Alberta, both the cities of Calgary and Edmonton have somewhat different target industries and geographic locations than their provincial counterparts, but there is overall agreement on a core of activities and target jurisdictions.
- **Select Specific Regions**: The next step is to consider where those industries or businesses are concentrated and pinpoint specific cities, and geographic regions in which to concentrate the city's marketing efforts
- **Prioritize**: Many economic agencies establish both primary and secondary markets for their investment marketing programs. This is usually necessitated by cost factors. It is not realistic to market to all regions that meet industry and or company target parameters. So a primary/secondary market strategy aids the community in prioritizing ongoing initiatives. For most city-regions or communities, the primary market will be a combination of the nearest large metropolitan centers, followed by opportunities within the national context and border countries and finally "overseas" markets.
- **Focus on Existing Multinational/National Companies in the Region**: A standard benchmark in investment attraction experience (western experience) is that about 75% of new foreign direct investment is actually "follow on" investment by established multinational or national companies already in the region and/or community. Therefore, a key priority of any marketing and investment promotion program is to work closely with existing foreign-owned or national companies and identify future opportunities (over an upcoming period of many years) to secure additional capital investment into the region from that company.

4.3 Develop the Marketing Message

Creating a message for Daqing involves establishing a marketable identifier based on the competitive strengths of the Daqing city-region as well as defining the opportunities and development goals of the Daqing and Heilongjiang agencies responsible for marketing and investment promotion for the region. For instance, we know that two goals that Daqing is pursuing are to align their economic development strategy with the larger initiative related to the HDQ Corridor, as well as to attract non-petroleum based industry. Therefore, the message that Daqing develops must address these issues.

Messaging must choose content that means something to the prospective target/client—or they won't notice it. This focused approach to marketing will enable Daqing to create a message that appropriately targets the industries and businesses of interest to the Daqing-city region.

The ICF marketing framework involves the following steps to create an effective messaging platform:

Step One: Identify the Challenges Facing the Target Industries

Develop a message that is based on competitive challenges facing the target industry. If agencies responsible for marketing and promotion in Daqing do not know the competitive challenges of the industries they are targeting, then they must research and identify those challenges. In this context, a key factor influencing business attraction efforts today is site location criteria. When businesses decide to relocate or expand into a new region, a number of criteria are considered to select a site. The relative importance of the criteria will differ for each business, depending on the competitive challenge facing that target industry.

Step Two: Market Daqing's Competitive Solutions to Industry Challenges

Build the case or the main message for Daqing based on solutions the municipality can offer the target industry with respect to 'economic input advantage'. The solutions that Daqing can offer to a prospective industry target must be specific (e.g., proximity to suppliers, labor force availability and cost, available land and/or buildings, etc.) The higher the degree of specificity in the match between what the target industry needs and what the Daqing city-region can offer will differentiate Daqing from the competition. Based on the region's competitive strengths, research should be undertaken to identify possible site location priorities for targeted industries and businesses. Site selection criteria can be both "hard" and "soft"—but each are equally important. Hard factors include market size, proximity to customers/suppliers, land or buildings availability, labor force availability, and cost, etc. Soft factors include the business climate (e.g., taxes, legislation, regulations, etc.), quality of servicing to potential investors in start-up phase of relocation or expansion, cost of living, health care services, etc.

Step Three: Prepare

When businesses decide to relocate or expand, a number of criteria are considered to select a site. The relative importance of the criteria will differ for each business and type of industry target. Based on Daqing's competitive strengths and opportunities and development goals market research should be completed to identify possible site location priorities for targeted industries and businesses. Examples of site selection criteria include market size and access to market, proximity to customer/suppliers, available land and buildings, labor force availability and cost, comparable business costs, transportation infrastructure, etc. Other 'qualitative' factors, but just as important in relocation decisions include business climate, quality of life, cost of living, quality of schooling, leisure and cultural amenities, etc.

Step Four: Productize the Daqing Region and Market Image to Industry

Use industry-specific language that shows your understanding of the industry and showcases your competitive advantage and how this competitive advantage meets the targeted industries needs. This language needs to be consistent across different mediums and translated materials must consider the nuances of language ensuring the "message is not lost in translation." Where materials are meant to be distributed in foreign markets content must be to international standards and translations must be flawless. In addition, the crafting of the story that is to be distributed in international markets will be a different story than the story that is introduced in domestic markets. International materials must convey a global perspective and positioning of Daqing, international comparisons should be utilized, and message content should be relevant to different audiences. Materials that are to be used in international markets should convert costs to the relevant currencies that investors understand (e.g., USD, Euro, etc.).

Best Practice in Regional Marketing:
New York City Economic Development Corporation
www.nycedc.com

- Award winning site design
- Strong visual impact creates immediate emotional connection to City of New York
- Very easy to navigate with color coded sections and subsections on the left hand side
- Alternate navigation on top right of page entitled "help me find info about…" allows site visitor to move to specific areas very quickly
- Site loads quickly
- Topical information allows site visitor to easily find relevant information about the business environment, projects to work on, financing and the geographies that make up NYC
- Ability to subscribe to a newsletter allows NYC to build database of prospective businesses considering business in city
- Can also subscribe to press releases
- Outlines success stories that site visitor can relate to
- Available projects section allows site visitor to immediately translate site visit into bidding on a project that could earn them money

4.4 Select Effective Mix of Marketing Techniques

In developing a marketing program one must decide if it is to build general awareness, lead generation, or both. As awareness building reaches a mass market, it can be very expensive and difficult to measure whether the program is having the desired effect. However, if the focus is lead generation, results will be obvious. Once this is decided, the marketing message will follow using an appropriate medium (marketing technique), such as advertising, tradeshows, on-line information, or sales calls to target audiences.

Every medium (marketing technique) must have a "call to action" which results in a telephone conversation, meeting, information request, etc. Each marketing message needs to be delivered to where the target market "lives" in a language or set of symbols they will recognize and through medium (marketing technique) they will notice. Choosing the most effective medium (marketing technique) to deliver messages is crucial and can be different for each industry and/or company being targeted as well as for the goals of the region relative to the objective (e.g., awareness of lead generation). Each industry has its own trade and professional associations, events, journals, magazines, websites, and spokespersons. Marketing material therefore needs to be delivered via different mediums for each industry—not generic brochures (which all read alike).

Following are examples of proven marketing techniques that 1) build general awareness and 2) targets lead generation. The overview also denotes the relative cost and effectiveness of each technique. (e.g., Cost: $/Effectiveness: High):

Best Practice in Regional Marketing:
Vancouver Economic Development
www.vancouvereconomic.com

- Strong imagery of the area creates emotional connection
- Easy to navigate website
- Main image and key marketing messages at top of page always changing—"easy access to international markets, one of the most livable cities in the world, the fastest north American port to Asia"
- Data Centre section provides key economic, business and tourism data, in addition to key industry studies
- Services section outlines how to work with Vancouver Economic Development
- Key sectors profiles six Vancouver clusters

- **Corporate Servicing Programs** [Targeted Lead Generation]: If there are a number of multinational and/or national corporations or businesses that have already established a presence in Daqing, their commitment to the region needs to be recognized so that further investment (re-investment) opportunities are maximized. These companies need to be nurtured and recognized by the local community for their contribution to the local economy. A corporate servicing program allows city officials to respond to the company's ongoing business needs. Determining potential or existing impediments to the company's growth, especially those under local control, affords the economic development office to proactively address the issue (e.g., human resources, infrastructure, financing, etc.) in a timely and efficient way. By working closely with local management to solve their business issues—a company is more likely to consider re-investment in new projects, etc. ($/High)
- **Personal Contact** [Targeted Lead Generation]: Any type of personal connection with a prospective business will enhance the probability of that company investing in the region. Personal contact can take many forms. The most common personal contact approach is lead generation through the corporate call to explore growth opportunities for the company and to demonstrate the support the economic development organization can provide. These corporate calls can result from introductions at trade shows, through meetings of international delegations, or from local business networking opportunities. Developing a methodology to initiate and influence personal contact opportunities is a process that requires planning and training, but it can be very effective in the long run. ($/High)

- **Site Location/Selection** [Targeted Lead Generation]: Another essential mechanism in any marketing and investment promotion program is the site selection process. Current practices in site selection drive much of the activity related to investment inquiries in all regions of the world. The typical site selection process can be direct contact to an economic development organization by a prospective investor/company, or indirect contact by a third party, such as a realtor or site selector representing the client.

  When contacted by a site selector, the region is expected to respond to specific questions meant to narrow the field of prospective locations by eliminating regions which do not meet requirements. The types of projects that usually employ site selectors are large capital investments and can be very complex. Sometimes, the site selector not only recommends locations to the industry client, but also will be the person negotiating incentive packages from interested regions, etc. Therefore, the region must have, ready at hand, a comprehensive site location package that adequately details information on the region's economy, industries, and most importantly, the economic foundations of education, training, finance, physical infrastructure, tax, regulatory environment, and quality of life.

  Best Practice in Regional Marketing:
  Edmonton Economic Development Corporation
  www.edmonton.com
  - Information divided into three primary areas—travel, tourism & leisure; business & economic development; statistics & reference information—that direct a visitor to their specific area of interest
  - Profiles successes / wins on home page
  - Highlights upcoming city events
  - Is available in six languages

  Efforts to respond to site selector inquiries are best managed by a regional collaborative team that can assemble relevant private and public sector information and materials. Having said this, the very first cut of site selection may very well be the internet presence of the region. Site selectors expect a region's internet presence to be complete with current and relevant information that they can self serve. If the site selector doesn't find engaging and timely regional information on the internet, they may very well discard or eliminate that region from the site selection process, without any direct contact at all.

  Therefore an effective internet-based marketing and investment promotion site is a key strategic resource—and should not be just another marketing brochure put on the web. A regions' economic development website should contain all the fundamental information that answers site selector questions, such as community information, cluster profiles, market information, labor statistics, demographics, etc. and e-mail and phone contact information. This information should be updated regularly to ensure currency and relevance. ($$/High)
- **Direct Mail to Investors, Brokers and Site Selectors** [General Awareness and/or Lead Generation]: On a mass market basis, direct mail (e.g., brochures sent out on in a non-targeted way) may create overall awareness, but is very expensive and produces few qualified leads for investment into a region. ($$$/Low). The exception to this is when direct mail is specifically targeted to real estate brokers and site location consultants and information is provided to targeted brokers and site selector to keep them abreast of changes. This type of targeted direct mail if done properly, positively impacts and influences brokers and site selectors' decisions relative to recommending a region as a potential investment site. In this instance, direct mail can be an effective lead generation tool. ($$/High)
- **Spokespersons** [General Awareness]: Develop spokespersons to position Daqing as a leader in targeted industries. The spokesperson or the organization he/she comes from needs to be

recognized as a leader or innovator in the marketplace. A testimonial from this type of spokesperson will lend credibility and create a positive brand position for Daqing (by association). Testimonials can be delivered in print (trade magazines, Daqing marketing pieces, etc), video, web, or TV advertisements. On outbound and inbound trade missions, spokespeople can speak to the Daqing environment and validate the Daqing business and investment climate. When a cluster approach is adopted in a region—spokespeople can play key roles in advancing the image of the region. Identifying these people through the cluster strategy process is easy because they become very visible through the natural leadership role they typically take on within the collaborative process. ($/High)

- **Advertising Campaigns in Target Industry Publications and Trade Journals** [General Awareness]: Identify the publications, associations, trade journals, and related forums associated with each target industry. Select messaging content for each campaign and ensure that this messaging is aligned to your web-site and existing collateral material (brochures, videos, etc.). Use testimonials and always provide a "call to action" (steps for contact and follow-up) in every advertising campaign undertaken. Advertising campaigns are the most expensive activities that an economic development agency can undertake. An advertising campaign may provide limited lead generation, but typically these campaigns are undertaken with the objective of enhancing the visibility / awareness of a region in specific markets. Because it is one of the most expensive undertakings, a preferred strategy for advertising is to partner with other stakeholders (e.g., industry partners that will benefit from the advertising) in order to lower the cost and to provide a check and balance to ensure the economic development agency is adhering to the actual needs of regional stakeholders. Measurement tactics are important considerations in this activity (e.g., trackable web links, print coupons, or innovative contests can be integrated into this type of activity). ($$$/Low)

Best Practice in Regional Marketing: England's Regional Development Agencies

www.englandsrdas.com

- Site developed to cooperatively sell England, while simultaneously profiling the various regions that make up England
- Speaks to what they do
- Covers frequently asked questions
- Jumping off spot to each of the regional development agency individual websites

- **Exhibiting at Trades Shows in Target Industries** [General Awareness/Lead Generation]: Select the trade shows to attend to build awareness and the tradeshows to attend when "selling." Select industry specific trade shows such as oil and gas shows, or "themed" trade shows, more broadly focused on generic themes, where there is partner buy-in. Lack of partner commitment is a good measure of the lack of local perceived value of the trade show. ($$/Medium)
- **Outbound Investment Missions to Target Markets** [General Awareness/Lead Generation]: This requires strong planning and tremendous logistics capabilities within the organizing agency. Outbound missions should always include the participation of the private sector. Any outbound mission should seriously consider some type of media strategy that will generate publicity in the outbound location. Usually these trips have high-powered people participating, who have the potential to be newsmakers, and they can generate increased visibility in the target market and leverage awareness. Business journalists in the outbound location can easily be contacted and at a minimum, a media advisory should be developed announcing the mission, etc. ($$$/Low)
- **Inbound Missions from Target Markets** [General Awareness/Lead Generation]: Invited tours for target industry to region. This activity also takes tremendous planning and hosting capabilities. The cost-effectiveness of this activity is traditionally the lowest of all activities

that an economic development agency can undertake. There are two types of inbound trips—those where people are buying and those selling. The vast majority (99%) of inbound trips are missions where the participants are selling. To minimize the challenges and cost of these activities there should be a determination in advance of what the visiting delegation is selling and what they want to buy. ($$$/Low)

- **Sales Calls in Target Markets** [Lead Generation]: Economic Development agents representing the Daqing region target specific industries and companies in specific cities or regions contact the companies in advance and travel to the geographic targets to pitch the competitive advantages of investing or locating in the Daqing region. This tactic only produces results if the targeting is accurate, the agent is experienced at direct sales, solid research has been undertaken to provide a compelling argument to the prospective investor, and the activity is sustained over time. Often, this technique will require annual trips over a two to three year period (depending on the business cycle of the targeted company) before results are evident. However, if the proper preparation has occurred and if the agent is skilled in personal direct sales and persistent, then the effectiveness of this type of marketing activity is high. ($$/High)

4.5 Utilize Checklist to Ensure Daqing's Marketing Activities include these Essential Efforts

A Marketing and Investment Promotion Plan should include the following:

- ✓ **Objectives of the Marketing and Investment Promotion Program**: A statement of objectives in order to determine the effectiveness of the plan once it is implemented. The clearer the objectives the easier it is to measure the results of the plan;
- ✓ **Detailed Research on Region/Municipality**: Detailed research on the region outlining the state of the local economy, identification of cluster strengths, competitive advantages, opportunities;
- ✓ **Detailed Review of Target Industries**: Targets should reflect Daqing's competitive strengths, opportunities and economic development goals;
- ✓ **Geographic Markets to Concentrate Marketing Programs:** The world is a very big place and marketing resources are always limited. Success in this area requires solid research with identifiable opportunities;
- ✓ **Description of recommended and agreed-to marketing techniques and materials**: Developing a marketing program that *integrates* materials and techniques requires extensive planning and resources. Design and functionality of on-line products and services should carry through in all collateral print pieces, all of which should underpin the region's brand image or positioning. One theme properly executed in several mediums provides positioning consistency and recognition to the target market. A region should not try to undertake more than four or five techniques at any given time, as it is better to focus the marketing approach on a select grouping of techniques for a sustained period of time.
- ✓ **Roles and Collaborative Mechanisms for Community and Regional Stakeholders**: Determine who will lead the marketing initiatives and the roles that municipal and regional partners will play. Daqing needs to bring together all the city and regional agencies and determine roles and responsibilities of each agency in the overall marketing efforts of the Daqing-region.
- ✓ **Detailed Budget and Timeline:** Prepare a detailed budget and timeline and identify all sources of funds. Ensure adequate time for data collection, research, collateral material design, collaborative community consultations, implementation, and follow-up has been allocated.
- ✓ **Performance Measures:** Performance measurement for marketing and investment promotion is very difficult, but without a doubt the most important part of any campaign. While there are

no standard measurements that can reliably show which individual activities are truly effective in achieving goals and objectives of a marketing and investment promotion plan, measurement metrics must still be obtained. Performance metrics are usually measured two ways:

1. **Measuring Level of Activity:**

- Number of inquiries received and responded to (Reactive) or number of agency calls made (Proactive);
- Number of website visits, specifically related to timing of other marketing programs;
- Special Events Undertaken: industry dinners, inward our outbound missions, tradeshows attended, etc.

2. **Measuring Effectiveness**

- Number of project files opened (sometimes ranked)
- Number of relocations based on contact
- Number of media contacts
- Number of media mentions
- Number of Prospects (all companies or individuals who have been contacted through calls, direct mail, trade shows, etc.)
- Number of Suspects (all companies within your target industries and in your target markets which might have an interest in the Daqing city-region)

5. Daqing's Competitive Advantages are the Basis for its Marketing Message

5.1 Introduction

The formation, expansion, and attraction of companies and investment into Daqing's clusters depend largely on the region's capacity to provide sources of economic input advantages. Putting the ICF marketing framework to work starts with a good appraisal of regional economic input advantages and then matching those advantages to target industries, as described above.

The following list of categories is the "menu" that needs to be understood and matched to any given industry - very specifically. This menu outlines the strengths of key business environment or factor conditions in Daqing. A critical driver of business attraction and investment is the "regional business environment" in which firms must operate. This environment is embodied in broad areas that affect firms' success in productivity and hence their interest in locating or re-locating to any given location. Generally, these broad areas include the presence of high quality and specialized pools of human resources, basic and applied technology infrastructure, and sources of capital tailored to the needs of particular industries. In addition to these "input" advantages - also critical to a firms' decision to locate in a specific region is the extent of local sourcing from capable suppliers based in the region (e.g., a critical mass of capable local suppliers), or in other words, the portfolio of existing clusters within the region and the maturity of those clusters in terms of depth and breadth, specialization, etc.

5.2 Daqing's Competitive Advantages

Innovation

The capacities for innovation in Daqing—particularly in the petroleum industry—are high. Daqing has over 150,000 scientists and researchers in over 100 research centers, including six provincial level testing centers and more than 50 laboratories. The city is home to the Daqing Petroleum Institute—which ranks among the best in the country.

- **High level of innovation in the petroleum industry (upstream):** The petroleum industry is frequently cited as Heilongjiang's industry with the best level of innovation—and Daqing is at the center of that. Daqing has over 150,000 scientists and researchers in over 100 research centers, including six provincial level testing centers and more than 50 laboratories. About 60 percent of this research is estimated to be in the petroleum industry. The research is mostly applied research and technical testing. (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).
- **Major innovation results in petroleum and petro-chemicals:** Since 2000, the petroleum and petro-chemical industry has achieved 21 provincial-level R&D results and has developed 135 new technologies.
- **Innovation concentrated in PetroChina R&D centers:** The PetroChina Daqing subsidiary companies have 15 R&D centers (and more than 50,000 researcher and scientists), e.g., Petroleum Academy, Petro-Chemical Engineering Research Institute, Daqing Petroleum Normal College, Daqing Medical School, and the Drilling Research Institute for Natural Gas (Interview, CNPC).
- **Strong university-industry linkages, particularly in applied research:** The Municipality of Daqing and the Science Bureau have encouraged strong linkages between industry and research centers. Each one of the 100 research centers in Daqing is affiliated with a university; Daqing has seven universities. The Daqing Petroleum University works closely with Daqing Petro China companies in R&D, particularly applied research (Interview,

Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).

- **New R&D centers (primarily petroleum-related) emerging from university-industry linkages:** Universities and corporations are creating new linkages in order to share the costs and benefits of R&D.
  - **High Molecule Material Technology R&D Center:** A product of a joint investment by Daqing city government, Petroleum Research Institute, Daqing Petroleum University, and Russian scientists. (Interview, Petroleum Research Institute and Heilongjiang Longwei Petro-Chemical Company).
  - **Fine-Petrochemical Research and Development Center:** A product of joint investment by Petroleum Research Institute, Heilongjiang Longwei Petro-Chemical Company, and the Petro-Chemical School of Daqing Petroleum University. The university provides the infrastructure and the partners all share staff for R&D. The institute pays professors to do research and owns the intellectual property. The company performs commercialization (Interview #29, Petroleum Research Institute and Heilongjiang Longwei Petro-Chemical Company).
- **Daqing also home to R&D in manufacturing and agriculture:** Beyond petroleum, other R&D in Daqing mainly supports mechanical manufacturing and agriculture (specifically dairy). (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group). The August 1st Agricultural University is among the best in China.
- **Daqing is home to nationally-designated high-tech park:** The National High-Tech Park in Daqing is designated a "National Level High Tech Development Park," of which there are 52 so designated in China.
- **Rubber Park has high concentration of plastics research in Daqing:** There are 50,000 plastics researchers in Daqing, many of which are at the Honggang Rubber Park, founded in 2004 and home to 12 companies in tire recovery and recycling. One company in the park is commercializing a sapphire chip product (with uses in defense, auto, and photocopiers) with Heilongjiang Institute of Technology and a Shanghai research institute (Honggang Rubber Park).

Land Use

- **Inexpensive industrial land:** Industrial land in Daqing can be 135 yuan/square mile, compared to some southern cities where it could be 600 yuan/sq m (Daqing Assessment of Local Industry Structure).
- **Home to 20 industrial parks, including nationally-designated high-tech park:** This number does not include facilities for petrochemical industries. The largest industrial park is the National High Tech Park (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).
- **Industrial parks meet company's basic needs:** Companies in Daqing's industrial parks cite the city's good provision of basic infrastructure to manufacturing plants inside the industrial parks, including roads, basic utilities, and special energy needs. In 2005 Forbes' Magazine Survey of Best Business Cities in China ranked Daqing as # 9 in China for investing in/building a manufacturing plant.
- **Incentives to companies in high-tech parks encourage industrial development:** Daqing's tech parks offer incentives to companies that enter the parks with such government agencies as the Ministry of Science and Technology. Incentives include grants for construction, free land, start-up capital, incubation services, lab space, and other on-site services such as banks and supermarkets. These incentives serve to encourage industrial development.

  - **Fine Petrochemical Products Park is product of public-private cooperation:** The 4-square-kilometer park was originally developed in 2003 for PetroChina. Companies in the park benefit from free use of land, grants of 500,000 RMB for construction, and use of raw materials and services from the adjacent PetroChina plant. The municipality of Daqing built the facility and attracted companies to the park. By the end of 2005, the park had more than 50 manufacturers and should reach full capacity soon (100). (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).
- **Competing with Daqing's land use are its rich agricultural resources:** Daqing's plentiful natural resources make it competitive in the agriculture of peppers, peanuts, and other products (Interview, National High-Tech Park, Daqing Qingte Food Company Limited).

Transportation/Logistics

- **Two rail lines intersect in Daqing, and the city has more than 30 rail stations:** Intersecting in Daqing are two rail lines that service both passengers and freight—the Binzhou Railway spans the Ha-Da-Qi Corridor and forms a hub in Daqing with the Rangtong Railway. There are more than 30 railway stations in Daqing (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).
- **Rail is sometimes the preferred method of transportation; it is 80-100 percent cheaper than road transportation:** Rail transportation is occasionally the preferred transportation by the private sector because it is 80-100 percent cheaper than road transportation (Interview, Department of Science and Technology of Heilongjiang). Products shipped by rail include raw materials, grain, steel, oil, and gas. (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).
- **A new airport is under construction for Daqing:** This airport, situated 20 km from Daqing city center, is expected to be completed by 2008. Construction began in August 2006 and the design will allow for runways that eventually accommodate 737s and 747s. Freight planes will carry only small products, so no rail modal will be necessary (Interview, Heilongjiang Development and Reform Commission and Heilongjiang Financial and Economic Leading Group).
- **Daqing Petroleum is Asia's biggest industry-owned ATM optical fiber network:** The ATM optical fiber network built by Daqing Petroleum is the biggest industry-owned optical fiber network in Asia. (Daqing Assessment of Local Industry Structure) Company).

Power Supply

The low cost and consistent supply (and surplus) of energy in the Daqing city-region (provided by CNPC-owned utilities) are some of the region's strongest assets. Local companies frequently cite the region's cheap and reliable electricity and natural gas as their reasons for locating in the region. Water, gas, and electric along the region are favored in price and reliability over most other Chinese cities.

- **Daqing has an abundance of energy resources:** Daqing has a strong supply of energy resources, including electricity and natural gas. The city's current electricity capacity is 1.86 million kW, with 260,000 kW excess supply. PetroChina subsidiaries own and operate the electricity and gas utility companies.
- **Energy costs are lower than in more developed coastal regions:** Energy costs in Daqing are relatively lower than in more developed coastal regions. Low cost and consistent supply are big attractions for companies to the Daqing region, particularly those that are energy-intensive.
- **Industrial parks are reported to be meeting companies' basic needs:** Companies in Daqing's industrial parks cite the city's good provision of basic infrastructure to manufacturing plants inside the industrial parks, including roads, basic utilities, and special energy needs.

- **Companies are moving to the Corridor because of energy advantages:** Lower cost and greater abundance of natural gas and electricity were what attracted Gungyi (a glass company) from Hong Kong to the Ha-Da-Qi corridor (Interview, Honggang Glass Park).

Environment

- **Adequate system for industrial waste disposal:** Daqing has adequate industrial waste disposal; according to a World Bank report, 95 percent of firms in Daqing meet environmental standards for wastewater disposal. This is behind Dalian and Qiqihar, but ahead of Chongqing, Shenyang, and Harbin ("Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006).

Financing

- **City government financing available to mostly large, high-tech companies:** The city-owned Daqing Commercial and Industrial Guarantee Company guarantees debt up to 40 million yuan.
- **Daqing Commercial Bank finances companies that help city development:** The Daqing Commercial Bank provides commercial loans to companies in food processing, real estate, petrochemicals, and manufacturing. The Bank targets financing toward companies that help city development, e.g., recent loans to companies that make ethanol from corn and process soy.
- **Tech parks provide funding:** Many parks provide funding at different stages of corporate development. It is common for companies to get some funding through the tech parks (Interview #23: National High-Tech Park, Overseas Park, Huatai Company).
- **Daqing is committed to increasing its financial services capabilities:** Daqing intends to support development of investment companies and guarantee agencies, and aggressively attract domestic financial insurance agencies and develop a full-range of financial services (Daqing Assessment of Local Industry Structure).

Human Resources

- **Daqing is home to some of the best skills in China in the petroleum, petro-chemical, and agriculture industries:** Daqing, home to China's largest oil field, has some of the best technical skills in the industry, with 50,000 scientists at such universities as Daqing Petroleum University and Heilongjiang Agriculture University (Interview #22, National High-Tech Park- Economic and Technology Development Bureau).
- **Daqing has attracted two new major universities:** In the past few years, Daqing has successfully attracted Daqing Petroleum Institute and August First Agriculture University from other Heilongjiang cities. The city has also attracted other Heilongjiang universities to establish branches in the city.
- **Daqing's population has higher-than-average education:** According to a World Bank report, 19.3 percent of Daqing's employees are university-educated, one percentage point higher than the 120-city average of 18.3 percent ("World Bank Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China").
- **Daqing spends far more on education than other Chinese cities:** Daqing spends 757 rmb per capita on education, roughly equivalent to Harbin but much higher than the Northeast China city average of 425 yuan, and higher than the average in most other developed regions of China (e.g., Bohai: 593 yuan, Southeast: 715 yuan). ("World Bank Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China").
- **The city is advertising the National High-Tech Park to get expatriates to return to Daqing:** The Daqing City Foreign Affairs Office is using the National High-Tech Park as an advertisement to attract back to Daqing some of the estimated 20,000 young professionals who are former residents living elsewhere in the world. To date, the program has resulted in

approximately 70 former Daqing residents returning to develop 40 new enterprises in the Park (Interview, Daqing City Foreign Affairs Office).

Quality of Life (Housing, Healthcare, and Social Amenities)

- **Daqing has the best air quality on the Corridor**: According to survey data, Daqing has the best air quality on the Ha-Da-Qi Corridor—with the percentage of days with good or excellent air quality totaling 97%. Comparison cities Qiqihar (88%), Harbin (82%), Shenyang (82%), and Chongqing (66%) all lag behind ("Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006).

Governance

Governments at all levels exert influence on the business environment and in the retention, attraction, and formation of business enterprises. The government's role should be to improve the business environment. The role of government in the process of investment and enterprise attraction is to improve the basic inputs of economic foundations, such as human resources, physical and technological infrastructure, and capital. The government also creates rules, regulations, and incentives that encourage innovation through regulations, tax policy, etc. The tax rates, the "return on taxation" (what companies get in public benefits for the tax levels/tax holidays they receive), regulatory requirements (how efficient regulatory procedures are and whether there are one-stop-shops for development permits), administration (the degree to which government services (local and provincial) are customer centered/quality focused), all effect the potential success for business.

This section is devoted to *municipal* governance issues—the policies and practices that affect the formation, retention and attraction of business in the Daqing-city region.

The city of Daqing offers several advantages for a positive business climate. Daqing offers one-stop shop facilities to speed permitting and administrative practices that are generally viewed as responsive and customer-focused by businesses that we interviewed. Daqing also offers direct financial incentives for industrial development, particularly to businesses in tech parks. In Daqing, incentives include tax "holidays" on corporate taxes, reduced VAT taxes on machinery, and associated inducements, such as low interest rates on loans, free land or factory space, plus funding for R&D.

- **Daqing's offers the most competitive financial incentives for development of the Corridor cities:** Daqing offers incentives for large, high-tech projects with good market potential. Incentives include reduced loan rates, free factory space or land, and R&D funding. While Harbin and Qiqihar cannot afford such incentives, Daqing has higher tax revenue base that allows it to use financial incentives to develop targeted projects.
- **"One-stop shops" speed Daqing's business permitting process:** Daqing has established many one-stop business registration centers to assist with business registration. Companies in Daqing that were interviewed give Daqing favorable ratings on the ease of obtaining business permits and the city's willingness to provide assistance.
- **Business permitting is quicker in Daqing than elsewhere in China and elsewhere on the Corridor:** Survey results show that businesses in Daqing have to spend far less time with government agencies than do businesses in Qiqihar and Harbin ("Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006").
- **Permitting is quickest in the tech parks:** Many of Daqing's tech parks have a one-stop shop, with representatives from the city's commerce, tax, and planning departments, where a

company can finish all of its business permits and processes. In the Daqing National-Level High Tech Park, a business can reportedly finish all of its permits and procedures in one week (Interview, Daqing Baiautai Technology Company Limited).

- **Daqing has the fastest customs clearance on the Corridor:** Daqing has by far the quickest customs clearance (8.1 days on average) of any of the other cities on the Corridor. It is competitive with the rest of China as well ("Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China," World Bank, 2006").

6. Effective Marketing Requires Cross-Jurisdictional Collaboration

Collaborative marketing needs to be developed as part of the cluster framework. This process should engage representatives of all clusters, institutions, and political jurisdictions (and relevant government entities with a responsibility for marketing or brand positioning). While the City of Daqing can develop a marketing strategy independently, unless it is organized as a collaborative effort—reflecting (ideally) a bottom-up, cluster-based and foundation focused economic development framework and strategy—it may not be as strong as possible. Therefore, Daqing must focus its efforts on building an inclusive marketing team, including representatives in the following categories:

- **Government:** Daqing and the Province should collaborate in developing a consistent story for Daqing (as part of the province and related to the Ha-Da-Qi Corridor), ensuring that resources are well used.
- **Industry Portfolio:** Representatives from each cluster should help craft a story for each target market. Distinctive messages need to be crafted which identify commonalities that would be a shared asset for each cluster as well as specific distinguishing cluster features that would enhance the industry image in key markets.
- **Economic Foundations:** Each foundation should have representatives that can help craft the story of advantages and match them to each industry (as well as provide stories of how they have worked with industry).

9. Qiqihar Water/Wastewater Sector Strategy

By Larry Quinn[107]

EXECUTIVE SUMMARY

Mission Objectives and Statement of Work

Through a grant from the Cities Alliance (TF055010 China: Economic Revitalization by Cities in Heilongjiang Province), Dr. Larry Quinn was contracted to provide a strategic review of the Qiqihar urban infrastructure needs and the development of a prioritized potential investment program. The World Bank is potentially interested in partnering with the City of Qiqihar in the improvement of their urban infrastructure in accordance with their planned 5-Year investment program, but support is subject to the agreement by center authorities of NDRC and MOF. The objective of the visit was to continue ongoing support to Qiqihar regarding its continued environmental strategy and related project preparation development as part of the Heilongjiang City Development Strategy (CDS) program, and to provide advice on the potential for international finance to Qiqihar.

This mission was a continuation of work initially undertaken in a short mission by Dr. George Taylor, consultant to the World Bank and Mr. You Ji, World Bank Beijing Office in April 2006. As stated by their field visit report, the CDS Program would like to contribute to "strategic urban environment projects that facilitate and assist in the development of **high quality, financially sound and sustainable utility companies**." The objectives are to ensure that the **final plan represented the least cost or most cost effective solution to the relevant problem and would not be an unsustainable financial burden on local government agencies.** Technical and financial evaluations are needed along with **rigorous EIA** reports and Resettlement Plans if it is applicable.

Mission Scheduling

Dr. Quinn's first mission to Qiqihar was conducted from October 10 to October 21 in Qiqihar. Dr. Quinn was joined during the first week by Mr. You Ji of the World Bank Beijing Office. The mission met Qiqihar Vice-Mayor Mr Tian Guoliang and representatives of the following agencies:

Qiqihar Development Reform Commission (QDRC),
Qiqihar Municipal Construction Commission (QCC),
Qiqihar Municipal Finance Bureau (QFB),
Qiqihar Municipal Water Administration Bureau (QWAB),
Qiqihar Municipal Water Supply Company (QWSC),
Qiqihar Municipal Drainage Department (QDD),
Qiqihar Nanjiao Wastewater Treatment Plant (QNWTP),
Qiqihar Municipal Environmental Protection Bureau (QEPB)

[107] Larry Quinn, PhD, PE, Larry Quinn and Associates

Dr. Quinn is tentatively scheduled to return for another 2-week mission to Qiqihar in April of 2007 to finalize a description of potential priority infrastructure project investments for Qiqihar, for international loan/donor funding.

The cities of Harbin, Qiqihar and Daqing form the Ha-Da-Qi Corridor. They are part of the "economic corridor", an area that the provincial government is keen to develop into an integrated productive unit. Planning horizons in this study are set at the years 2010 and 2020. The former coincides with the end of the 11th five year plan (11 FYP).

Qiqihar 11th 5-Year Plan for Environmental Protection (2006-2010)

This report was produced by the Qiqihar Environment Protection Bureau in August of 2005, in conformance with central government planning and directives. It outlines the current environmental problems in the Qiqihar municipality, potential environmental targets for the next five years relative to these issues, and a series of proposed projects are recommended to work toward meeting the environmental objectives.

Some of the current problems that Qiqihar has been experiencing were noted as follows:

- Environment quality has not met requirements for this area.
  - For Nenjiang River; COD is higher than standards for Class III.
  - For Zhaolong Wetland; ammonia, phosphorus and manganese are problems.
  - Air pollution lower than Class 2 in some areas.
  - Urban center noise levels too high.
- For village areas, over 77% of wastewater is untreated.
- Solid waste from urban cities treated properly is less than 40%.

The Nenjiang River is targeted standard for Class III protection level. Upstream of Qiqihar urban center, the river meets Class III standards. In sections between Liuyuan to downstream of Fulaerji near urban center and wastewater discharges the River is Class IV. As the Nenjiang continues downstream, it again reaches the Class III standards. The report provides loading targets for discharges from all industries, with unclear methodology for calculations. Urban pollution source targets are not clear either. [It is noted later in the report that clear connections to the loading targets for any wastewater control project for Qiqihar municipality should be made.]

Relative to solid waste, the urban cities solid waste that is treated properly is noted to be about 30%. The report suggests the need to build 13 solid waste disposal plants for urban areas, including one 300 ton composting plant for urban center (cost 56M RMB) and another 12 landfill facilities. The total suggested investment for solid waste was 600M RMB. For whole of Qiqihar Municipal Area, the report suggests the construction of 8 new WWTPs, with total finance of 662M RMB. They are listed in the following table.

Name	Period	Capacity m^3/day	COD Reduction	Finance (M RMB)
Fulaerji	2006-2009	100,000	3795	170
Nehe	2006-2010	20,000	1692	34
Longjiang	2006-2010	20,000	2309	77
Tailai	2006-2010	60,000	1051	100
Gannan	2006-2010	21,000	1366	36
Fuyu Pond Enlargement	2006-2010	Increased capacity	1510	4
Yian	2006-2009	1,000	146	70
Qiqihar Plant Number 2	2006-2010	100,000	2790	170

The projects proposed by Qiqihar all emerge from the current 5-year plan for environmental protection, but the current project documents do not connect with the goals and objectives of this planning. For instance, the following plans are noted for water quality protection in the 5-Year Plan, and each of these Plans should be understood in detail by the Bank, and the way that each potential Qiqihar component project connects to and facilitates these goals and objectives spelled out:

- Total protection plan for Nenjiang River from pollution.
- Zhaolong Wetland Protection Plan
- Drinking Water Plant Protection Plan
- Total Pollution Control Plan

We will discuss specific questions related to the potential component projects, but in general, the overall situation on the Nenjiang River should be clearly understood. This would include the watershed protection measures upstream of the urban center, the impact of hydraulic change due the recent completed reservoir in upstream, and how all wastewater (urban, industrial, rural, agricultural) sources of pollution will be controlled, and how proposed WWTPs fit into this context.

The situation regarding the proposed 5-Year plan load reductions that are spelled out should be understood in relationship to the problems meeting the Class III water quality objectives from Liuyuan Section to Fulaerji Section, and how the proposed component projects are a part of this overall solution. The reasons for selection of these particular components over other needed WWTPs and other actions outlined in the 5-Year plan should be easily understood, in conjunction with plans to control industrial loads.

Brief Review of April 2006 World Bank Mission

The April 2006 WB mission obtained a large list of potential projects on the Qiqihar 5-Year investment plan. The proposed investments are listed in the following table together with the project cost estimates, as of April 2006.

Qiqihar 11th Five year Plan Projects – Urban Environment – April 2006

Sector	Project Scope	Estimated Cost (RMB million)
Water Supply	Distribution system upgrading (139 km of water mains and 70 booster stations); Upgrading of 4 water treatment plants	349
Sewerage and Wastewater Treatment	Expansion of sewerage system in central city (258 km sewers and 22 pumping stations), Expansion of sewerage system in Fulaerji industrial district (84 km sewers) and in Nehe city (38 km sewers, county town level city under Qiqihaer municipality); New wastewater treatment plants for central city (100 000 m^3/d), Fulaerji (100 000 m^3/d) and Nehe city (20 000 m^3/d)	867
District Heating	New and replacement district heating pipework to use heat from an existing power station; heat exchange stations. New added district heating facilities will cover a total heating supply area of about 10.08 million m^2.	574
Solid Wastes Management	Closure of Nanshan landfill site and expansion of two other sites.	600
Labour Lake Improvements	Environmental improvements to Labour Lake including wastewater interception; stormwater management; roads	116
Zhao Long Wetland Improvements	Restoration of wetland and water/soil conservation	2 100
Industrial Wastewater Treatment	Wastewater treatment at a total of 7 industries including paper mills, food, chemicals and engineering plants	176
TOTAL Urban only	 (excluding Zhao Long Wetland)	4 623 2 523

The October mission discussed the individual projects with the agencies concerned and made a number of site visits as appropriate. The Qiqihar needs and potential loan projects from the April listing were reviewed in detail by this mission, and a revised listing of needs will be presented later in this report. The 11th Five-Year Plan for Environment Protection was obtained

from the City EPB and reviewed relative to driving forces for the proposed infrastructure investments.

Brief Summary of Ha-Da-Qi Corridor Sector Report and Qiqihar

This study was an "Urban Environment Review" (UER) and was funded by the Italian Consultant Trust Fund at the World Bank. It was prepared by the Joint Venture between the international consultant companies C. Lotti & Associati and Mott MacDonald Ltd. This sector report was completed in June of 2006.

The Lotti report used a basin water quality model and other tools to assess the potential effectiveness of proposed 5-year investment projects in the three cities. The study covered the cities of Harbin, Qiqihar, Daqing and Mudanjiang which are in Heilongjiang Province. The objectives of the assignment were summarized in the report as follows:

- Review the urban environmental issues
- Analytically review the strategy and plans
- Assess the short and medium plans for environmental investment plans
- Explore the range of financing and assistance options

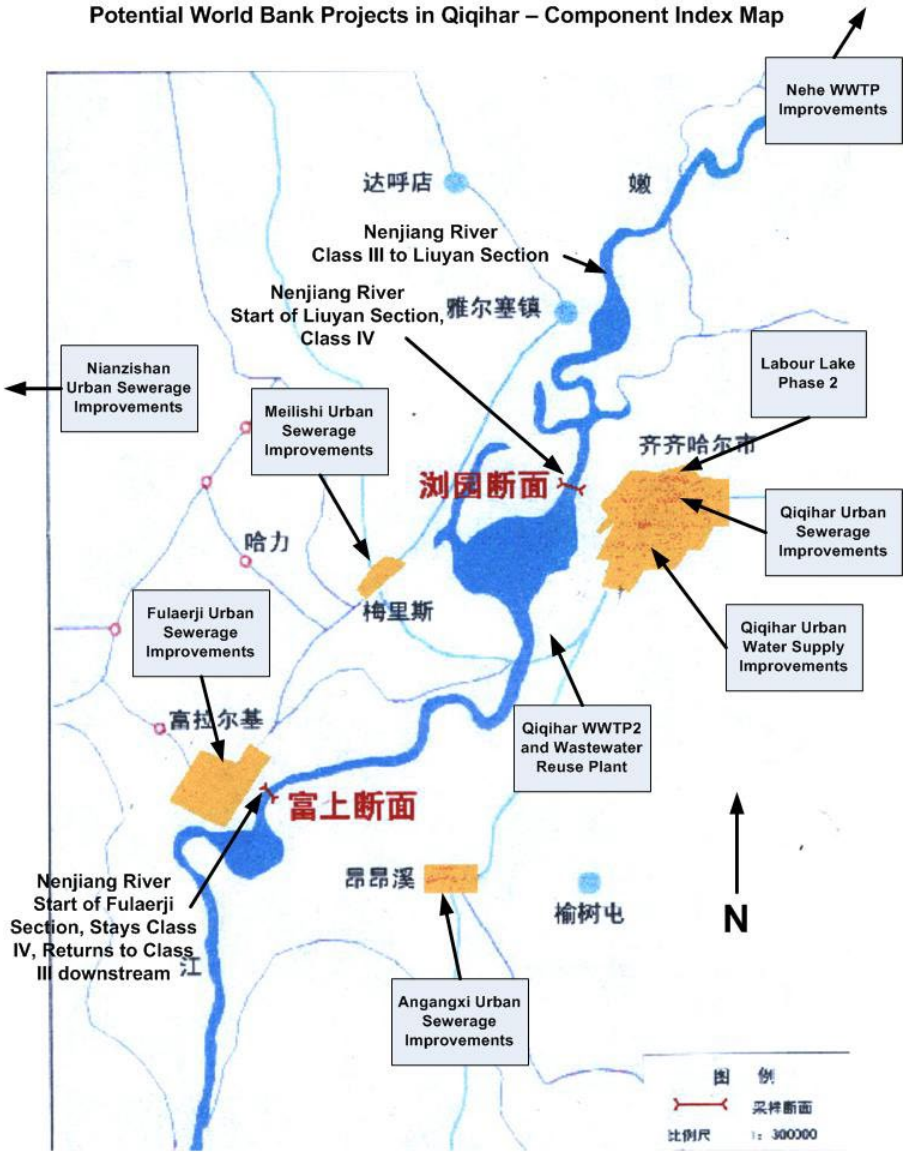
Although the consultants had sent the report in Chinese to Qiqihar earlier, no one present in the meeting discussions during the October mission had any knowledge of its preparation, contents, or recommendations. A digital copy was obtained from Mott MacDonald and distributed during the October mission but little feedback was received.

The Lotti Report contained lists of 5-year projects that were more inclusive that the project list that Qiqihar has provided the WB in the April or October missions. However, these projects were reiterated as being the City priority projects.

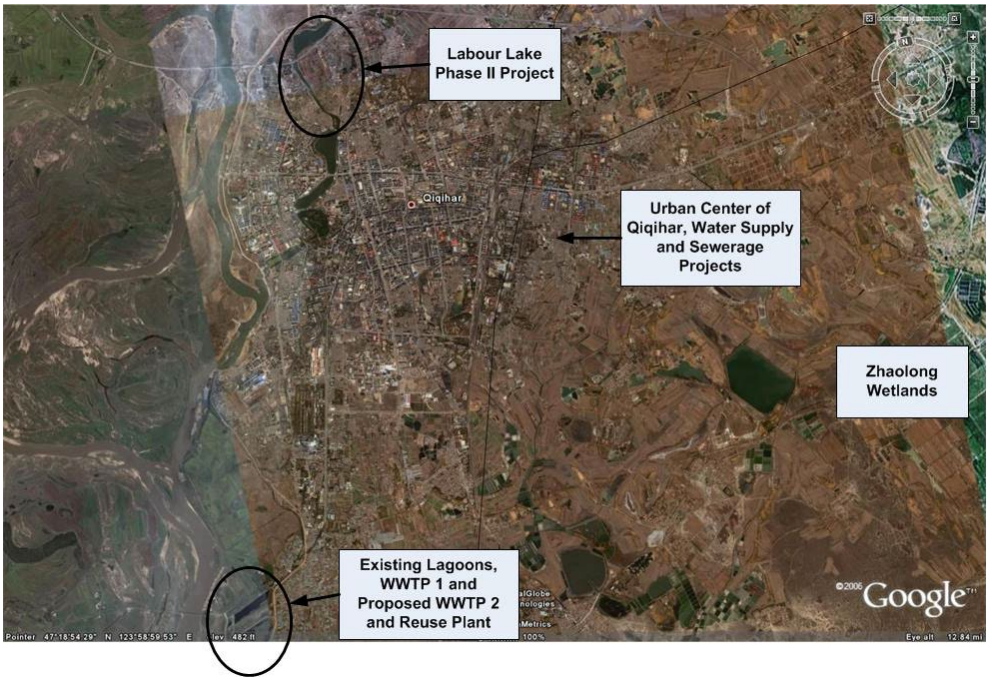
It was also noted in the Lotti Report that Qiqihar has demonstrated a growing interest in the last few months for the study program of the World Bank, also regarding introduction of a "River Pollution Action Plan", focused on a few municipalities, which will be developed as an annex to the 11th five year Plan. The projects included in the river basin plan will be financed by Central Government funds for 40% of investment costs. Again, there was little feedback on this planning during the October mission.

Detailed Review of Proposed Infrastructure Components

For each major area of infrastructure, this report first provides some of the findings and recommendations of the April 2006 World Bank mission, and then provides updated information from the October 2006 mission. The following index map shows the general locations of the proposed infrastructure components.



The following Google Earth aerial photo shows the Qiqihar urban area:



Water Supply Systems

The initial project FSR is as follows:

Raised Pressure and Pumping Stations and Pipe Changing Project
Qiqihar Municipal Engineering Design Institute (QMEDI), August 2005

The project involves three major subcomponents: (1) Replacing old and/or undersized piping systems, (2) New and enlarged pump stations and affected piping, (3) Technology improvements at groundwater pumping plants. The water supply system has been noted as being dilapidated and with significant water losses. The 2005 FSR has been updated by the Water Supply Company in the following document:

Project of Center City Water Supply Changing System, Related Files
Qiqihar Water Supply Company, April 2006

As previously noted, there are three major subcomponent projects associated with the water supply project. They are listed below along with some design details and cost information:

1. Pipe Changing Project

Total Cost Estimate, 56.16M RMB, of which support from central government funds is 16.0 M RMB, to now (included 12.0 M RMB public debt to be repaid to central government.)

Detail is 52.51 km of pipe. In the past, the pipes were not sized sufficiently to handle the current large economic growth, so some need replaced. The second reason is that some areas require the pipes to be realigned to meet current development needs. Some pipes are also too old and they lose water and make some villages not receive sufficient supply.

2. Increase Pressure and Pump Station Changed to Larger Ones and Related Pipes Changing

Total Cost Estimate, 260.5 M RMB
Building 70 increased size pump stations, associated pipe changing of 139.22 km

3. Clean Water Station Technology Changing Project

Total Cost Estimate, 23.34M RMB
Manganese is the problem at the groundwater treatment plants. There is a new more stringent national standard for manganese that the existing groundwater facilities are unable to meet. Involves three groundwater supply water treatment plants:

a. Tiefeng
b. Jianhua
c. Longsha

Current Cost Estimate for all three subcomponent projects:

56.16 + 260.50 + 23.34 = 340 M RMB

It is not clear as to how much of this total is desired to be in WB loan project. At the wrap-up meeting, the possibility of the City building subcomponents 1 and 3 over the next two years and then adding the subcomponent 2 for increasing pressures as a potential loan component. The second component is by far the most expensive one of the three. However, no final decision was made.

EIAs on Water Supply Projects:
Although the FSR covers all three subcomponent projects, there were three separate EIA reports prepared for the subcomponents.

1. Pipe Changing Project
The Building Project Environment Influence Report
Project Name: City Center Water Supply System Pipes Changing Project
Project Company: Qiqihar Clean Water Company
Prepared By: Heilongjiang Scientific Research Institute of Environment Protection
Dated: December 2003

2. Increase Pressure and Pump Station Changed to Larger Ones and Related Pipes Changing
The Building Project Environment Influence Report
Project Name: City Center Water Supply System Increased Water Pressure Pumping Station Reduced Numbers to Larger Ones and Related Pipes Changing Project
Project Company: Qiqihar Clean Water Company
Prepared By: Harbin Railway Bureau Environment Protection Company
Dated: September, 2005

3. Clean Water Station Technology Changing Project
The Building Project Environment Influence Report
Project Name: City Center Water Supply System Clean Water Changing Project
Project Company: Qiqihar Clean Water Company

Prepared By: Harbin Railway Bureau Environment Protection Company
Dated: September, 2005

The Overall **QWSC water system master planning** should be better understood relative to the current supply versus demand, surface water usage versus groundwater usage, losses in the current system and how this project helps to alleviate, water quality issues in both the surface and groundwater systems and watershed protection plans, connections with the sewerage planning to ensure adequate sewerage capacity in place before additional water supply is provided, improved understanding of the industrial self-supply situation and whether QWSC may be taking over some of these self-supplies.

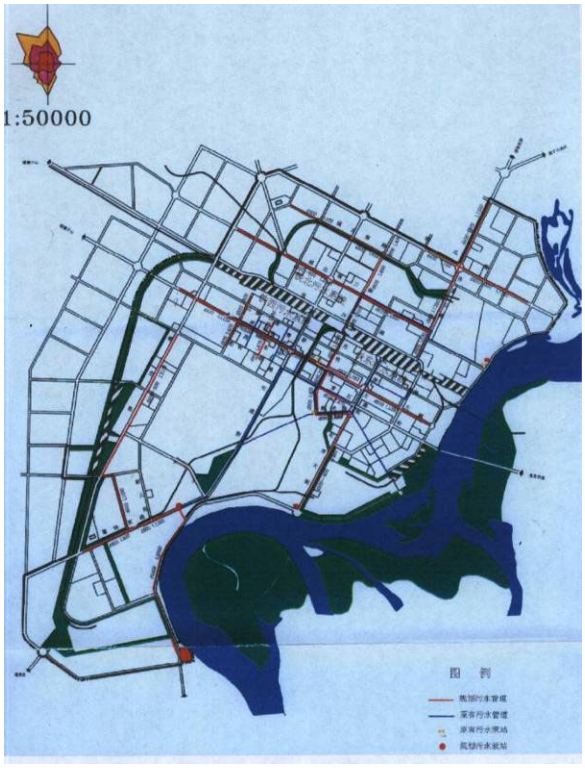
More detail is required on the **financial analysis** of this proposal relative to the existing and proposed tariffs, and overall affordability of the proposed improvement programs, and ability to service the proposed loan.

It is noted that an **EIA** has been completed. Please confirm if any resettlement is required for this project, and if a **resettlement plan** has been completed. Note that the international financing agencies has very specific resettlement plan requirements.

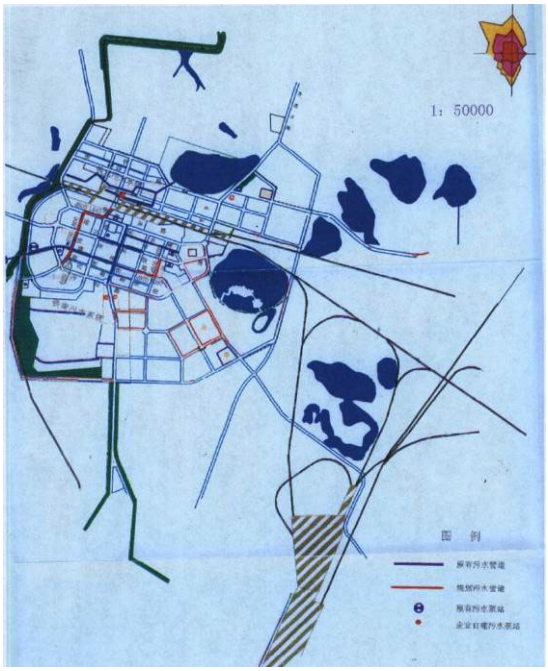
Sewerage Systems

The index map at the beginning of the chapter provides the locations of the sewerage systems in areas outside the urban center. The following drawing from the FSR shows the details of the significant sewerage improvements, with the proposed pipe systems shown in red, for the Qiqihar Urban Center and the other smaller areas:

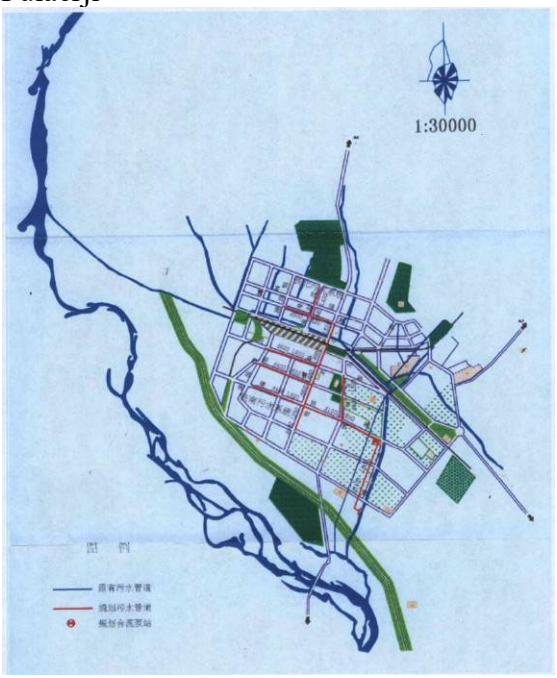
Qiqihar Urban Center



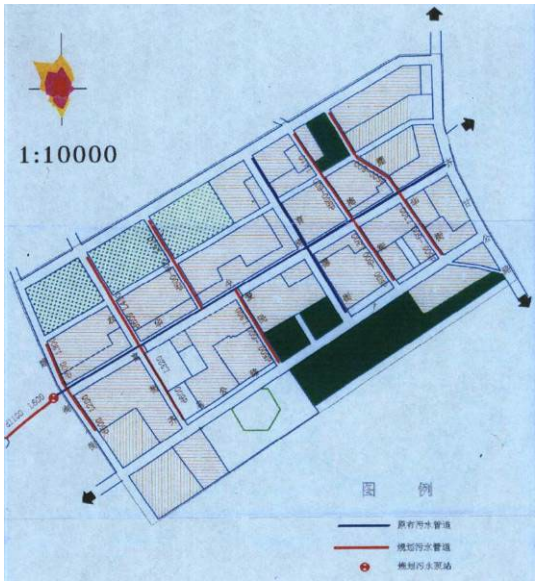
Fulaerji



Angangxi



Nianzishan



Melishi

The project FSR is as follows:

City Sewerage Expansion and Pipe Changing Project Report, Feasibility Report
Qiqihar Construction Design Institute
March 2002
Project Company, QDD
Project Person, Yu Xiao Ming

The report contained the following general rationales for the project:

- Sewerage pipes not fully finished in service area (only 35.5% current served)
- Coverage after the project is 80 %
- Covers most of the city in either expansions or upgrades to existing sewerage network
- Old pumping stations need rebuilt (5), new pumping stations (17), Total 22

(Appears to duplicate some of Labour Lake sewerage system proposals)

The project covers outlying sewerage networks also, in addition to the urban center. In the Fulaerji area collection rate can also reach 80%, the Angangxi District rate would increase from 22.5% to 80%, the Nianzishan District rate can also reach 80%, while the Meilishi District collection rate increases from 40 to 80%.

For this design, up to 2010 the quantity of sewerage collected by all sewers in center city is 560,000 m^3 per day. To 2020, the quantity increases to 640,000 m^3 per day. All of this wastewater is directed to the existing wastewater ponds and treatment plant(s).

Area	New Sewerage Pipes (m)	New Pump Stations	Improved Pump Stations
Qiqihar Urban Center	74, 350	14	4
Fulaerji	32,320	1	0
Angangxi District	2,560	0	0
Nianzishan District	6,320	1	0
Meilishi District	3,880	1	0

The Project Approval has been received by the Heilongjiang DRC in 2002, Number 153.

Existing problems:

- Sewage pipes built in 1950's with insufficient size and coverage
- Typical problems of lack of wastewater collection, with many areas draining directly to the Nenjiang River

Cost estimates:

Total project cost estimate is 340M RMB (42.5M USD);
Installation Cost = 242M RMB
Design, Land Cost, Preparation = 68M RMB (Land cost portion = 0.34M RMB)
Other Costs = 30M RMB

FSR Update 2006:

- Central government promised 136M RMB for project. Bank loan 204M RMB, 170M RMB from bank loans and 34M RMB local prepared.
- Are they working on portions of project from central govt financing?
- Period is from 2003 to 2008, 6 year implementation
- From 2003 to 2005, finished with trunk pipes and small pipes, 22.6 km, built 4 new PS (cost was 44.69M RMB)
- Actual central government received to date 48M RMB (out of 136M promised)
- For 2006-2008 proposing to finish all work

Project EIA

The project EIA has been completed as follows:

EIA: City Sewerage Expansion and Pipe Changing Project Report
Environment Influence Report
Qiqihar Environmental Protection and Scientific Research Institute
October 2006
[Not yet approved by Provincial EPB]

With the updated year, a revision was made to the existing served percentage in 2006 is 47.15% in center city. Some changes from FSR quantities highlighted, with the main one being the urban center sewerage pipes were noted as needing 104,525m instead of the 74,350m in the FSR. This needs further clarification. Total Finance noted is 318M in EIA.

An **integrated wastewater master planning analysis** is needed to address the QDD sewerage system, QDD operation issues on the existing wastewater lagoon system, the Qiqihar Wastewater Treatment Plant Company existing and proposed treatment facilities, and other municipal wastewater treatment authorities that are planned (eg. Fulaerji). The analysis should be directly linked to the 5-Year plan for environmental protection showing how the proposed project(s) facilitate the goals and objectives of this plan. [Note that a new section has been added at the end of this chapter to further discuss the existing wastewater lagoon system.]

Each of the FSRs dealing with sewerage or wastewater treatment should be connected to this overall Qiqihar wastewater planning framework, so that the investment linkages and overall

planning can easily be understood. The wastewater planning analysis should also be connected with the QWSC water system planning to ensure coordination.

For this project, a few questions that this planning analysis should address:

- What is the existing operational plan for the wastewater lagoons operated by QDD and how does the addition of the additional wastewater from these new sewerage connections in the urban center affect this plan?
- How much of a problem with stormwater inflow occurs in the existing system and how much does this project solve the problem?
- How were the locations for the new larger pump stations selected and what provisions are there in the plans for power outages or emergency overflows of sewage?

The **financial analysis** of the project also requires further explanation. As noted in April 2006, the cost is extremely high, amounting to several years' current QDD wastewater tariff revenue (current tariff RMB 0.25/m^3 for domestic wastewater and RMB 0.4/m^3 for industry, which is less than the reported operating cost of the existing WWTP). The mission noted also that debt service alone would account for a very significant proportion of tariff revenue, and questioned whether such a large investment is affordable. QDD stated that there is a proposal to increase tariffs to RMB 0.5/m^3 and RMB 0.8/m^3 respectively. This also has to be connected with the debt service proposed for wastewater treatment, and whether there will be sufficient revenue to operate any wastewater treatment facilities, existing or proposed.

It is noted that the EIA has been completed and it is assumed that the approval of the Provincial EPB will be obtained prior to April 2007. Please confirm if any resettlement is required for this project, and if a **resettlement plan** has been completed. Note that the international finance agencies have very specific resettlement plan requirements.

Qiqihar WWTP #2

WWTP Number 1, Completed in 2003, A-B, 100,000 m^3/d

October 2006 Mission Updated Information

FSR Details

Urban City Wastewater Treatment Plant Number 2
Phase 2 Report
City Construction Design Institute
January 2006
(2006 supersedes a 2002 version)

The following Google Earth aerial photos provide details of the existing wastewater treatment area and existing WWTP1:

WWTP1 (WWTP2 proposed to be on right, reuse plant below)

The report indicates that the existing maximum wastewater flow of the City has reached is 400,000 m^3/d. In 2010, the average flow is expected to be 350,000 m^3/d. By 2020, average flow is expected to be 450,000 m^3/d. However, there is little information on the sources of these figures and estimates, and how much infiltration and inflow might contribute to these flow levels. There is no actual quantity or quality monitoring data on the incoming wastewater but there is one set of expected existing quality, without knowing the source or how many data points this represents. The 2002 earlier FSR had slightly different flows.

As will be reviewed in the section on the existing wastewater lagoons, the capacity of the existing lagoons is estimated at 250,000 m^3/d. The rationale for the sizing of the WWTP2 at 100,000 m^3/d was to obtain a full 200,000 m^3/d of mechanical treatment capacity (with WWTP1) to go along with the estimated 250,000 m^3/d of holding capacity in the winter lagoon system.

There is no real analysis of the interconnection of this planning and projection analysis with the planned extension and improvements to the Qiqihar sewerage network as outlined earlier.

Total Finance is 197 M RMB.

Incoming wastewater quality measured averages to WWTP1 is COD=360 mg/l, BOD=135 mg/l, SS=240 mg/l, TN=53 mg/l, TP=2.34 mg/l, pH = 7.13. (Design level BOD=200 mg/l, SS=220 mg/l). More detail needed on sampling of wastewater in system.

Incoming pump station and pipeline to WWTP1 – this project requires a parallel system of pump station and 2500m of pipeline from pond inlet. One wonders about why the system built for WWTP1 did not take into account expansions, and whether this is the least-cost option for supplying raw wastewater.

Design treatment levels are BOD and SS, 20 mg/l; TP less than 1 mg/l, TN, 20 mg/l: NH_3-N, less than 8 mg/l. The report had the following issues used in the alternatives analysis:

- Reasons for selecting A/O (total finance, running cost, O&M were factors)
- Compared to A/B, CAST.
- A/O better now, but number 1 plant had thought AB better
- Could be improved to A^2O in future if necessary

Discharge channel must be re-built for 200m to handle additional flow. [The same questions exist as for the supply pumping and pipeline. WWTP1 was only completed in 2003, yet the expansion was not seemingly addressed.]

Finance:

Total project, 1 WWTP and matched facilities to existing WWTP; 197M
Part 1 Construction, 160M, Other costs 37M
Planned finance: Central govt funds provided 60M; local funding 40M; Remaining needed is 97M

EIA:

Environment Influence Report
WWTP2
Qiqihar Wastewater Plant Company
May 2005
Qiqihar University Environment Influence Study Office

EIA was approved by central government, number 1705, 2005. As is the case with all the EIAs, there is little analysis or connection of the project to either improved water quality in the Nenjiang River or the 11th Five-Year Plan for Environmental Protection. This facility was mentioned in the plan, but there is no prioritization for the construction of this facility versus others mentioned in the Plan.

As mentioned above, an **integrated wastewater master planning analysis** is needed to address the QDD sewerage system, QDD operation issues on the existing wastewater lagoon system, the Qiqihar Wastewater Treatment Plant Company existing and proposed treatment facilities, and other municipal wastewater treatment authorities that are planned (eg. Fulaerji).

For this project, a few questions that this planning analysis should address:

- What is the existing operational status of WWTP 1 and what causes the facility not to operate at full capacity?
- How was this size and treatment process selected from an alternatives analysis, and how does this maximize benefits according to 5-year plan?
- What affect does this construction location have on the capacity and operation of the QDD wastewater lagoons in the winter storage months?
- Has the integration of operational aspects of the existing/proposed WWTPs been evaluated in conjunction with the existing lagoon systems to provide necessary COD loading reductions to the Nenjiang at least cost to Qiqihar?

The **financial analysis** of the project also requires further explanation. This also has to be connected with the debt service proposed for sewerage, and whether there will be sufficient revenue to operate any wastewater treatment facilities, existing or proposed. It is understood from the site visit to the WWTP1 that only 30,000 to 40,000 m^3/d of wastewater is treated in the facility in the non-winter months, due to budgetary rather than physical limitations. The facility processes closer to 80,000 m^3/d in the winter to protect the structures from freezing.

Wastewater Reuse Project

The City is proceeding with final plans and specifications for the wastewater reuse project despite the issues raised by the April 2006 mission. The FSR is as follows:

Qiqihar Urban City Reuse Water Plant Project
Feasibility Report
Northeast China Design Institute
September 2005

Rationale for the project:

- To save water resources of the city.
- Reuse water plant uses wastewater, so it can reduce influence to the river.
- National law requiring wastewater reuse in power stations.

Reuse WWTP Design is for 60,000 m^3/d, outlet discharge pipes to industries is 10km, but use two pipes for a total length of 20km, reasons for 2 parallel pipes a bit unclear). Total finance is 101 M RMB. One design aspect was a report from the power plant on the quantity and quality of water needed from the proposed reuse facility. Reuse standard for design was national standard CECS61.94.

From the "master plans" for water supply and wastewater for the city, water resources demand for the future will be 900,000 m^3/d. For wastewater, by 2020 estimated flow would be 530,000 m^3/d. (may not be consistent with QDD estimates that said this level of flow obtained by proposed sewerage project) Report indicates power plant demand for 13,000 m^3/d. If they can obtain a contract, the papermaking plant could use 46,800 m^3/d.

Existing water supply system in Qiqihar has capacity of 300,000 m^3/d while existing usage is about 150,000 m^3/d. As such, driving force appears only to be the national mandate for power

plants to use reuse wastewater, although there is already significant water supply capacity in Qiqihar. In addition, the wastewater reuse cost per cubic meter will be much higher than the regular water supply. [It is noted that the Lotti Report indicated that Qiqihar did not have any surplus water supply capacity.]

Technology includes pumping station, chemical treatment followed by filtration, chlorination then outlet pumping. Wastes from plant sent back to WWTP headworks. A couple of alternate designs considered.

Finance:

- Total Finance 101.25M RMB
- Construction is 100.74M RMB
- Want 50-70 M RMB from Bank loan. (little unclear)
- Rate of return noted at about 6%, over 15 years
- Price for water to be charged at 1Y per cubic meter. (more than 3Y for factories now, unclear why subsidizing cost)

EIA for Reuse Project

Qiqihar Urban City Reuse Water Plant Project
Environment Influence Report
Qiqihar Environment Protection and Research Institute
October 2005
Project Company – Qiqihar Wastewater Treatment Plant Company

Reuse water plant uses 2.36 hectares of land. Main environment problems of city:

- Air pollution problem with TSP, SO_2, especially in winter heating months (small boiler associated with project)
- Surface water in most of the year is Class II, but sometimes flooding season to Class III. (reduces quantity of wastewater to river)
- Noise influences is Class III in project location. (equipment designed for low-noise to maintain Class III.

Solid Waste issue:

- Gives amount of production from FSR.
- No recommendations on treatment solids, just eliminate construction wastes
- Sludge and all other wastes back to incoming wastewater flow.

The FSR notes that the paper plant could use almost all of the other 50,000 m^3/day could be used by the paper plant, but there is no confirmed contract. Is this contract going to be signed?

Since there does not seem to be a direct environmental value to this project and it must be implemented quickly, will not include any of this component in a potential international loan.

Wastewater Treatment Ponds – Initial Issues

The 2002 FSR for WWTP2 (now superceded) had some information on the design and size of the existing wastewater lagoons. They are located adjacent to the Nenjiang River, and WWTP1 has been constructed adjacent to the lagoons. The WWTP2 and Reuse Plant are also located in

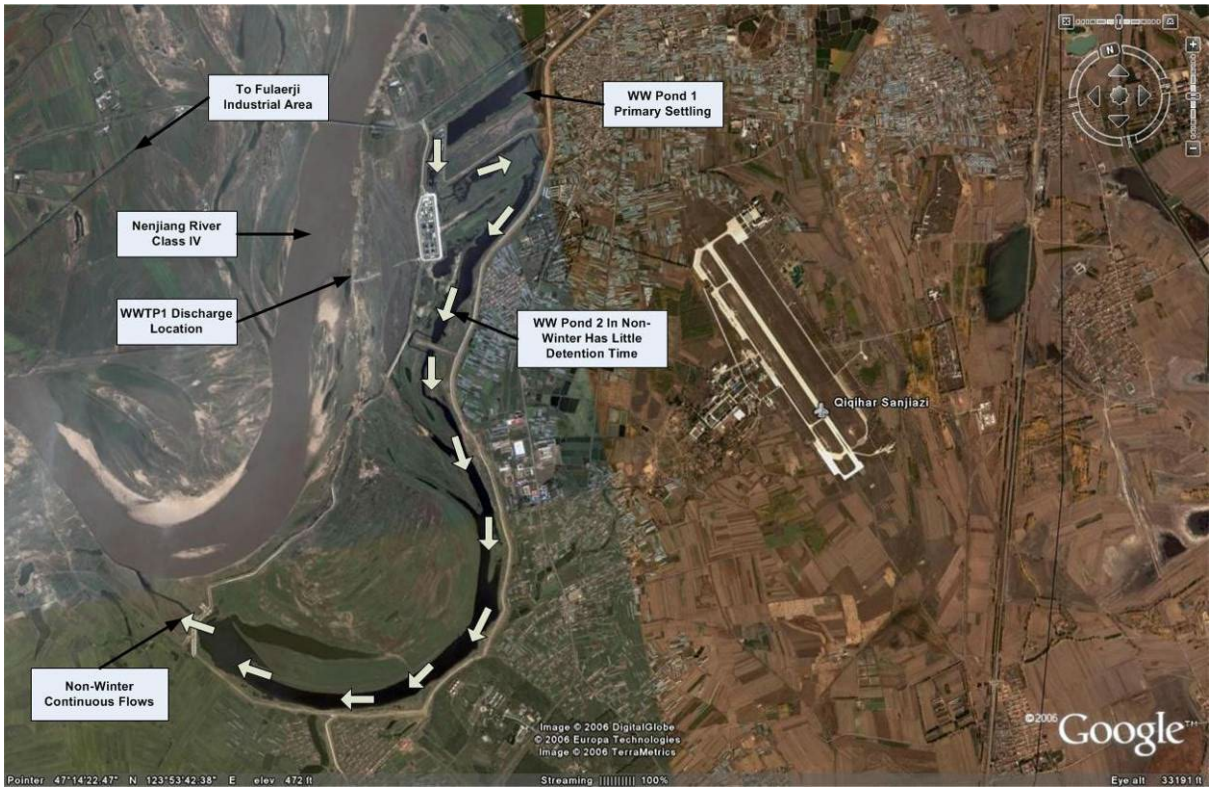
this area. The lagoons are owned and operated by QDD, while the mechanical treatment systems are owned and operated by the Qiqhihar Wastewater Treatment Company. This institutional issue seems to work against the planning and operation of these facilities in a coordinated fashion to maximize environmental benefit.

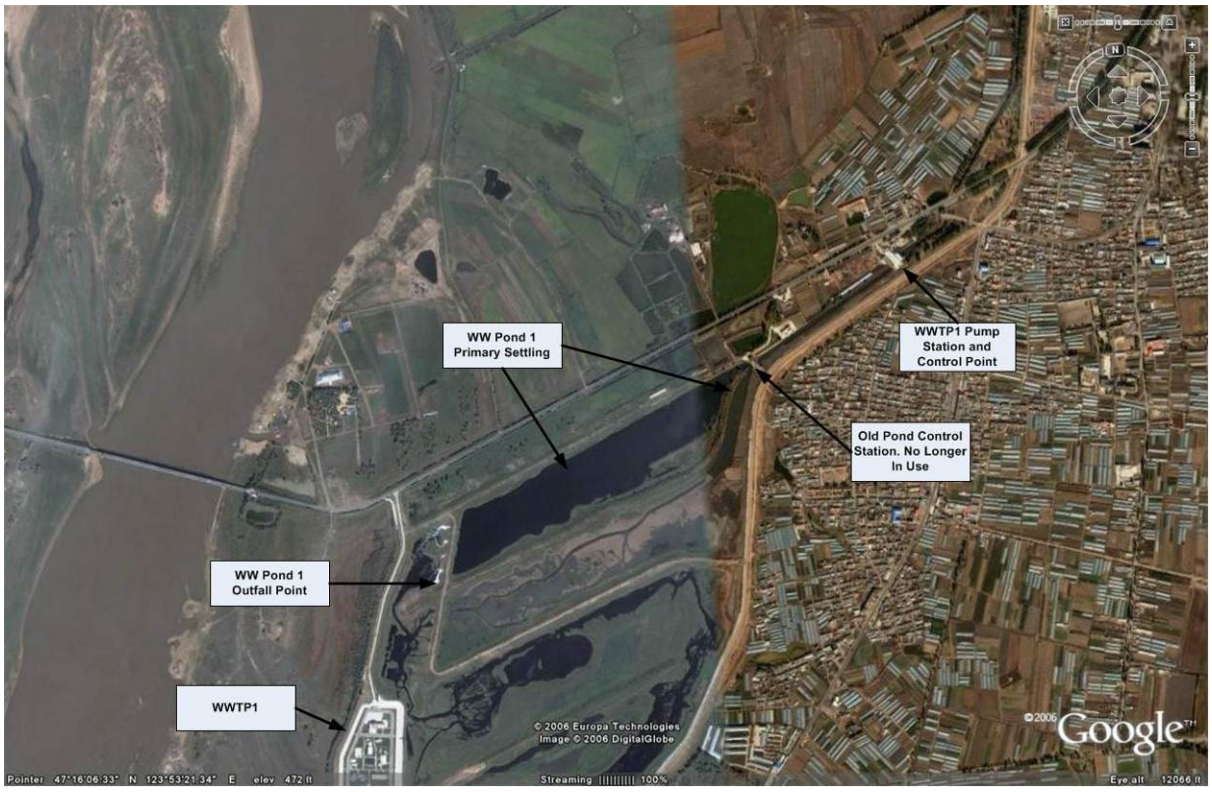
Wastewater ponds were built in 1970. Wastewater detention capacity is estimated at 250,000 m^3/d. The total area of the pond system is 846.5 HA. Total capacity of pond system is 26,000,000 m^3. Total water surface area is 752.5 HA. It is noted that the construction of WWTP1, WWTP2 and the reuse plant are all reducing the winter storage area of the ponds.

In the non-winter season, there is only one small wastewater lagoon near the open sewerage channel and the WWTP1 pump station. It is operated as a primary sedimentation basin and is dredged out by QDD every 1-3 years. Flow from this small lagoon flows in a circuitous path past WWTP1 to the Nenjiang River with little additional detention time.

The following diagrams, using Google Earth aerial photography, show the overall non-winter flow situation in the lagoons in large scale and a larger view of the inlet and small lagoon area. This is the normal operating mode of the lagoons for all seasons except the winter storage period.

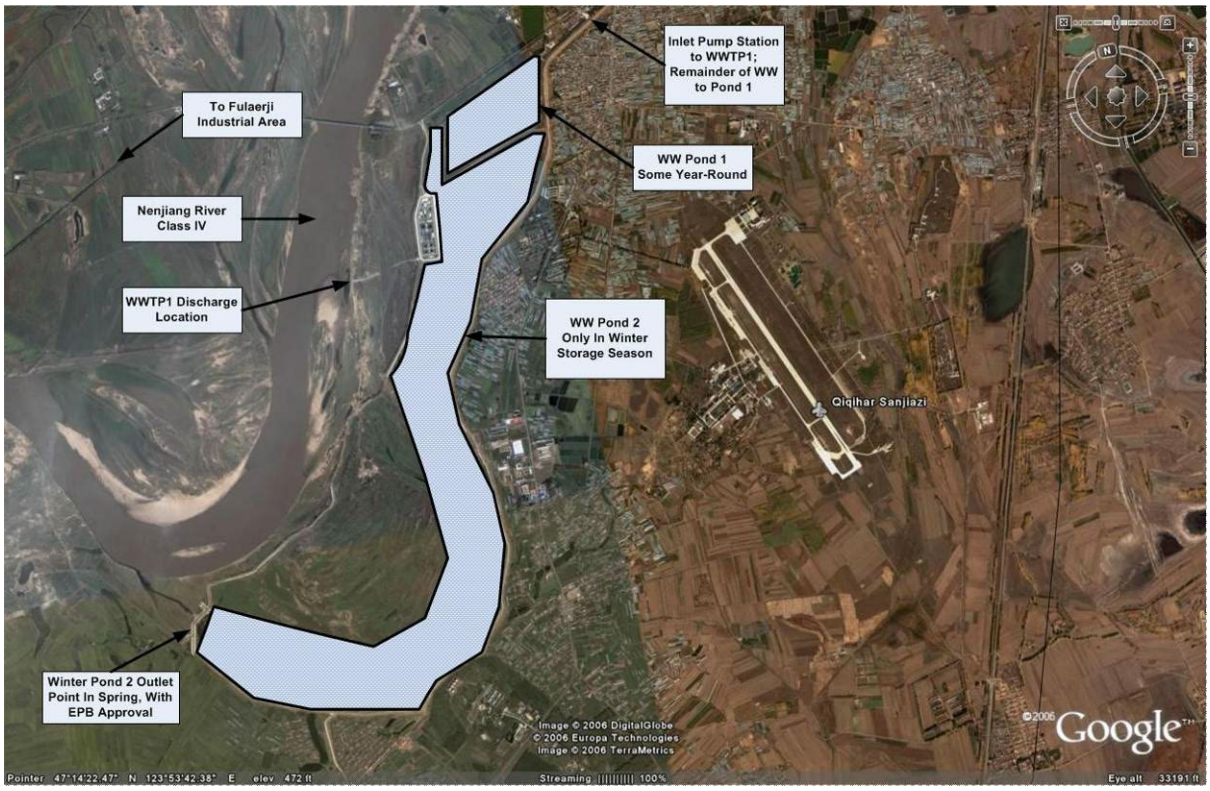
As outlined by Dr. George Taylor in April 2006, there are a wide variety of potential options to improve this lagoon and holding pond system into an improved wastewater treatment system. The potential conversion of this holding pond area to natural treatment systems including waste stabilization ponds and constructed wetlands could be viewed as sustainable technologies in such a context. This could include a stabilization pond series including anaerobic, facultative, and maturation ponds, but the extreme cold temperatures may require some detailed engineering creativity.





During the winter months, the outfall to the Nenjiang River is blocked, a second large holding lagoon forms as shown diagrammatically in the following aerial photo from Google Earth. This

lagoon is essentially a large holding pond in the winter and then is drained to the Nenjiang River in the spring, upon consultations with the City EPB.



There seems to be an institutional problem of control as well as a reluctance to consider anything beyond a mechanical wastewater facility as having any real water quality value. In addition, the lack of a well understood seasonal water quality analysis on the Class IV river segments through Qiqihar, updated to include the revised flow regime afforded by the new Nierji Reservoir, makes it difficult to assess the potential effectiveness of such options. As Dr. Taylor mentions, the combination of 1) using the WWTP1 to its design capacity, 2) potentially enlarging WWTP1 in combination with improved pond systems, must be investigated as a better interim wastewater strategy than building WWTP2.

Fulaerji Wastewater Treatment Plant

FSR:

Phase 1 Report
Fulaerji WWTP
Qiqihar Construction Design Bureau
Dec 2005
Fulaerji Drainage Company?? (why is Qiqihar QDD designing sewerage here?)

Main sewers are from QDD system and WWTP. However, the proposed QDD sewerage system improvements are necessary to get the wastewater to proposed facilities. There could be some overlap with QDD sewerage project.

Total outlet flow yearly 51M m^3 (correlates to about 139,000 m^3/d). Capacity for WWTP is 100,000 m^3/d, and future is 150,000 m^3/d. This is based on water usage by industries. The noted existing wastewater design flow is based on 44,625 m^3/d for urban population, and 59,670 m^3/d for industry, which is about the 100,000 m^3/d planned. No actual measured industry quality or quantity figures are given. Sludge after dewatering, use for planting (probably problematic due to high levels of industrial flow to the WWTP).

Finance:

- Include WWTP, six PS (in QDD?), outlet piping = 289M RMB

EIA:

Environment Influence Report
Fulaerji WWTP
Company is Fulaerji Drainage Company
November 2005
Qiqihar University Environment Influence Study Office

Total finance include outlet piping 84,000m (8.4km), six PS, new WWTP. [Since QDD has sewerage in Fulaerji in their project, one needs to insure that there is no overlap. It is also hard to understand why QDD is building sewerage, but this project is building pump stations.] Why is the site chosen for the WWTP?

There are many similar questions on the overall wastewater planning for Fulaerji as in Qiqihar, compounded by the large amount of industrial flows to the WWTP and unknown amount of current adequate pretreatment. However, a lot of time was not spent on this project as the DRC indicates that the project is receiving funding from the central government.

Labour Lake Phase 2 Project

Labour Lake Project Proposals
Phase 2 Project for Labour Lake
Labour Lake Phase 2 Project
Qiqihar Construction Design Bureau, December 2002
(Authority of Heilongjiang DRC), September 2003

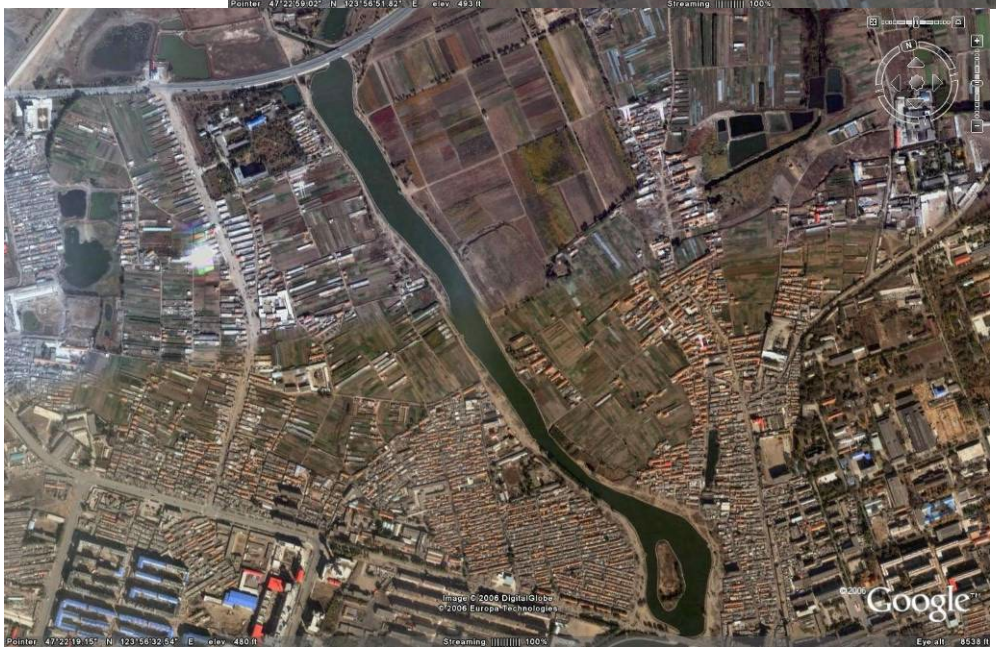
Project Manager is Vice Mayor Tian Guo Liang
Project Building Group is "City New Century Construction Building" (own land)

Summary:

- Project includes Labour Lake Nenjiang Park, Longsha Park and Xiushui Park, Hujiapao Park on north end of Labour Lake. This includes water area and surrounding lands.
- Total area is 225 Hectares. Water area is 100.6 HA, remaining land area.
- Wastewater collection (3600m) along west side flowing south and pumping station at south end pumping west to existing sewerage network. Stormwater collection is 4600m.
- Retaining wall of lake banks is 4400 m.
- Grass areas is 100,000 m^2

- Lake dredging project for sludge is 400,00 m^3 .
- One bridge rebuilt, Beida Bridge on south end of project. New bridge is 130m long and 30m wide.
- Roads are 620m of 7m width, 2040m of 9m width
- Sidewalk, fencing, lighting, etc

The Labour Lake Project is a second phase of a long-term improvement project which would improve the two northernmost incoming segments of the Lake. The following Google Earth aerial photos show the area:



Cost Estimate (2002):

Item	Cost Estimate (M RMB)	Cost Estimate (M USD)
Wastewater collection and pumping	6.02	
Stormwater collection	(in roads cost)	
Retaining walls	10.32	
Grass areas and landscaping/lighting	4.54	
Dredging Project	13.68	
Beida Bridge Rebuilding	15.65	
Roads and lighting	9.85	
Sidewalk, fencing, lighting, etc	(in roads cost)	
Environment and Resettlement???	Not identified	
Subtotal	60.06	
Engineering etc	23.02	
Other costs	10.04	
Total	93.12	11.64

Costs apparently updated to 2006 to get to 116M USD.

Environment Protection Section

- Laws, regulations and standards to be applied
- Other general requirements
- No specific issues

Project Arrangements

- After completion of project, water management of Labour Lake project turned to QDD, roads and parks to others (Labour Lake Water System Pollution Treatment and Develop Construction Center Company)
- Pumping station will employ 5 personnel
- Construction time period estimated at 3 years.

Financing Plan

- Total finance (2003) was 93.12 M RMB
- Public debt noted at 30M central government loan, 45M bank loan, remainder from internal financing.

Benefits

- Land price escalation for development, Xibo west bank is 500Y per m^2 in the future. Land for Xiushui part is 412Y per m^2.
- Production Ability Used Percent (BEP) ??, increased taxes
- Conclusion that “project internal rate of return is higher than 6%”

Final Conclusions and Suggestions

- Protection and treatment for environment is important to human life in city.
- Economic analysis that project is suitable.
- Project will give city benefits into the future.

- When project is finished, suggest that someone keep watch on whole system to ensure that no wastewater is discharged to the Lake or other negative environmental conditions.

Resettlement Issues:
- East bank of Xiushui Park, there are 526 families and factories that require relocation.
- Total area is 22,580 square meters affected.

Current cost estimate of 116M RMB, assumed 100% wanted to be included in an international Loan project. It is noted that the **2002 FSR must be improved and updated** both in technical analysis and financial analysis, and this can be completed by March 2007. It is also noted that an **EIA must be completed** for the project by March 2007. The 2002 FSR noted that over 500 families and small businesses must be relocated by the project, so a **resettlement plan** must also be completed for the project. Note that the **international finance agencies have very specific resettlement plan requirements**.

Some of the technical issues that should be addressed in the revised FSR include:
- A hydrologic study should be included in the FSR to provide guidance on the flow characteristics of the entire Labour Lake system, from the Nenjiang pumping station to the outfall back to the Nenjiang River. This should include an evaluation of the existing pumping station and water supply facilities in relation to the requirements found in the study to protect environmental conditions throughout the interconnected lake system. It should also address the proposed land uses surrounding the improved sections. It is noted that the eastern portion of Hujiapao Park Lake does not appear to receive sufficient freshwater flow as the inlet water goes directly to the south into Longsha Park, so the incoming flow distribution should be investigated. This study should also address the impacts of higher year-round flows in the Nenjiang due to the completion of the upstream Nierji Reservoir on the current pumping systems, and possible use of gravity feed systems to the Lake.
- The hydrologic study should be connected to a catchment management strategy that outlines any current inflows and potential sources of pollution to the Lake, and how they will be controlled, in conjunction with the implementation of this project. Existing water quality monitoring data for the lake system should be provided. The storm sewer system should be explained in detail and whether there is a need for water quality improvement measures for any drainage inflows to the Lake.
- Some of the sewerage systems proposed for funding under this project appear to be duplicates of sewerage already included in the QDD sewerage system project. (see map in sewerage system section.)

More detailed **financial analysis** should include both the one-time benefits (increased property values) and the ongoing benefits, relative to servicing the proposed debt.

Other Projects Not Included

District Heating
Although this was known to be a major Qiqihar priority project, it is not being included in this urban environmental infrastructure project. The World Bank energy staff have visited Qiqihar in

the past and informed the City to contact the MOC in Beijing relative to World Bank participation as part of a larger program of central heating assistance to China. Qiqihar should pursue this option if interested in World Bank assistance.

Municipal Solid Wastes
The mission was told that the proposed projects for solid waste management were not sufficiently prepared to be included in the proposed international loan components. However, the management of solid waste was noted as a significant priority in the 11th Five-Year plan for environmental protection. One large composting facility was outlined along with many landfill facilities in the municipal area. If Qiqihar could progress any of these proposals by March 2007, they could be added to the proposed list of loan components.

Also, the construction of the new WWTPs in Qiqihar will ultimately require the production of a strategy to address sludge management from these facilities. In other parts of China, the use of a well-conceived and designed landfill facility is usually a part of such a strategy, until there is sufficient control on the industries that discharge to the WWTPs. Although safe land utilization of the sludge could be an ultimate goal of such a strategy, landfilling is usually the interim method.

Zhaolong Wetlands
Per instructions from Qiqihar, no projects were evaluated for inclusion in an international loan Project.

Industrial Wastewater Treatment
As outlined by Dr. Taylor in April 2006, the international finance agencies would not likely provide a loan to these individual private industries so these projects were not evaluated. However, the Bank loan and project preparation could include an industrial waste strategy and action plan.

Analysis of Component Interactions

The various water-related projects in Qiqihar require an Integrated Water Resource Management Approach to planning and management of these water resources. The potable water supply, stormwater, sanitary wastewater, industrial wastewater, and treatment facilities need to be addressed in a comprehensive fashion in Qiqihar municipality. The control of urban, industrial and agricultural pollution upstream of Qiqihar urban center is important for watershed protection of the Qiqihar potable water supply. The seasonal flow variationis in the Nenjiang River, as controlled by the new Nierji Reservoir, affect the ability of the Qiqihar river segments to achieve the Class III water quality objectives in all areas. The planning of additional water supply facilities must have corollary planning of wastewater collection and treatment facilities. Finally, the operation of the QDD lagoon system and the mechanical WWTPs must be better coordinated.

These issues involve a variety of technical and institutional gaps and overlaps that are beyond the scope of this report to necessarily assess. However, it is obvious that there could be a great deal of improvement in the planning and management of the City's water resources to achieve environmental objectives at least cost to the residents.

Summary Comparison of Potential Qiqihar Loan Projects

The following is a summary of the potential component costs as of October 2006:

Water Supply Project:

Total project cost estimate is **340M RMB** (42.5M USD);
Assume **340 RMB?** in Loan Project??

Sewerage Project:

Total project cost estimate is 340M RMB (42.5M USD);
FSR 2006 update seems to say 170M should be in loan.
Assume **170 RMB?** in Loan Project??

Wastewater Treatment Plant 2

Total project cost estimate is 197M RMB
Assume **197 RMB?** in Loan Project??

Wastewater Reuse Project

Assume **0 RMB** in Loan Project

Fulaerji Wastewater Treatment Plant

Total project cost estimate is 289M RMB
Assume **289 RMB?** in Loan Project??

Labour Lake Project

Cost Estimate 116M RMB. Needs new FSR, cost estimate, EIA, resettlement plan.
Assume **150 RMB?** in Loan Project??

Potential Loan Package Summary:

Project	Potential Loan, M RMB	Potential Loan, M USD
Water Supply	340	42.5
Sewerage	170	21.25
WWTP2	197	24.6
Wastewater Reuse	0	0
Fulaerji WWTP	289	36
Labour Lake	150	18.75
Totals	1146	143.5

Financial Analyses – In addition to the updated and improved financial analysis on each potential component, an overall financial assessment and affordability review should be prepared for the complete potential loan package.

Review of Meetings Held and Wrap-Up Meeting

The meetings with the various government departments were productive, but somewhat limited to the proposed projects and project documents. Due to the dispersed responsibilities in the water sector, it was difficult to open a dialogue on integrated water resource and water quality planning strategies with any of the individuals met.

In addition, the planning seems more directed at meeting central government mandates using historical project configurations, rather than looking at more progressive and potentially lesser-cost solutions to the water problems faced by Qiqihar. Planning is done off a project checklist and the prioritization based on environmental benefits or the greatest impact per investment dollar does not readily seem apparent. The water reuse project is the most difficult to fully understand. Qiqihar does not seem to have a water resources supply issue, especially with the improved winter flows from Nierji Reservoir. Yet, they are proceeding with a high-cost low-benefit wastewater reuse scheme to meet central government mandates. This is being done when their current wastewater tariffs do not even allow the WWTP to operate at full treatment capacity.

A Wrap-Up meeting was held on October 20, 2006 with the deputy mayor of Qiqihar and other local officials (see annex). At the suggestion of the Qiqihar DRC, a fairly long discussion paper was prepared ahead of the meeting and translated into Chinese. Many of the issues, questions, and outstanding items that are included in this report were also included in this discussion paper. A copy of the discussion paper is included as a separate file (English and Chinese).

The meeting was generally positive the Deputy Mayor Tian indicated that he will pursue the District Heating project through the MOC as suggested by the World Bank. He also instructed the government officials to review the discussion paper carefully and make decisions on how to proceed with potential international finance on the projects. After making their decision, the Deputy Mayor also instructed his staff to work to prepare all the necessary documents outlined in the paper for the return of Dr. Quinn in April.

Future Work, Qiqihar and Quinn

The previous sections outlined decisions and additional information necessary to complete the priority listing in April. However, if Qiqihar decides to drop some of these from the list over the next few weeks, there is obviously no reason to prepare these responses.

Qiqihar was told to keep in touch with Mr. You Ji of the World Bank Beijing Office on progress in developing this information and reports over the winter. They were told that everything should be in place by March 2007 so that the Bank can decide on the proper scheduling for the second mission by Dr. Quinn.

Dr. Quinn encouraged Deputy Mayor Tian to proceed with the Provincial DRC in getting their projects into the provincial priorities for international funding. This work can occur simultaneous with the technical work over the winter.

Acknowledgements

Dr. Quinn would like to express his sincere gratitude for the cooperation and assistance provided by the Qiqihar City and Heilongjiang Provincial Authority during his mission. There was a very good level of cooperation amongst all parties and a proactive desire to move a potential international loan project to fruition. Dr. Quinn would especially like to thank Madame Wong of the Qiqihar DRC, Mr. Yin of the Heilongjiang Provincial Finance and Economic Office, and Mr. Li Cai, his invaluable assistance as an interpreter for the mission.

Annex 1 - Meetings Held and Participants

The following list of individuals and departments from the Wrap-Up meeting had all of the same individuals in other meetings during the mission:

姓名 Name	单 位 Affiliation	职务 Title	电 话 Tel	传 真 Fax	Email
田国梁 TianGuoliang	齐齐哈尔市政府 Q.Goverment	副市长 Vice major	0452-2790929	0452-2790929	
尹兴华 YinXinghua	省委财经领导小组办公室秘书组 Privincial econ&Finance committee lead team	副组长 Vice team leader	0451-82833909	0451-53003906	Ydkcy@163.com
张 成 ZhangChang	齐齐哈尔市发改委 Q.DRC	处长 Director head			
辛延德 XinYande	齐齐哈尔市发改委投资处Q.DRC	处长 Director head	0452-2790608	0452-2790608	2790608@163.com
王桂华 WangGuihua	齐齐哈尔市发改委投资处Q.DRC	副处长 Vice director	0452-2790608	0452-2790608	
赵昆海 ZhaoKunhai	齐齐哈尔市建设局 Q.Construction Bureau	处长 Director head			
袁立华 YuanLihua	齐齐哈尔市污水处理厂 Q.WWTP	经理 Manager	0452-2393566	0452-2393566	
李 才 LiCai	齐齐哈尔市污水处理厂 Q.WWTP	科长 section chief	0452-2391177-8018	0452-2393566	QQHRWATERWSP@126.com
李 健 LiJian	齐齐哈尔市自来水公司 Q.Clean Water Company	经理 Manager	0452-2387510	0452-2387510	
于晓明 YuXiaoming	齐齐哈尔市水务局 Q.Water Affair Burea	处长 Director head	2711500	2711500	

姓名 Name	单 位 Affiliation	职务 Title	电 话 Tel	传 真 Fax	Email
祝景忠 ZhuJingzhong	齐齐哈尔市排水处 QDD	副处长 Vice Director	2475185	2475185	
刘哲人 LiuZheren	齐齐哈尔市环保局 Q.Environment Protection Burea	副局长 Vice Director			
罗福义 LuoFuyi	齐齐哈尔市环保局 Q.Environment Protection Burea	科长 section chief	0452-6112584		
于兴华 YuXinghua	劳动湖水系办 Labor Lake Water System Office	经理 Manager			
于海洋 YuHaiyang	劳动湖水系办 Labor Lake Water System Office	副经理 Vice Manager			

Annex 2 - Mission Calendar

Sunday October 8,	Quinn Departs USA for China
Monday October 9,	Quinn To Beijing, meets You Ji of World Bank Beijing Office Flight to Qiqihar cancelled by airline; flight to Harbin instead Stay overnight in Harbin
Tuesday October 10,	Train in morning from Harbin to Qiqihar Kickoff meetings
Wednesday October 11,	Meetings Hire Mr. Li Cay as local interpreter.

Thursday October 12, Meetings

Friday October 13,	Tour of Qiqihar City Sites and Zhaolong Wetlands Report Reviews, Quinn and Mr. Li Cay

Saturday October `14, Report Reviews, Quinn and Mr. Li Cay

Sunday October 15	Report Reviews, Quinn and Mr. Li Cay
Monday October 16	Report Reviews, Quinn and Mr. Li Cay
Tuesday October 17	Tour of Labour Lake Project Tour of WWTP 1, proposed WWTP 2, proposed reuse plant Report Reviews, Quinn and Mr. Li Cay
Wednesday October 18,	Meeting with EPB Report Reviews, Quinn and Mr. Li Cay
Thursday October 19,	Report Reviews, Quinn and Mr. Li Cay
Friday October 20,	Wrap-up meeting
Saturday October 21	Flight from Qiqihar to Beijing
Monday October 23	Flight from Beijing to USA

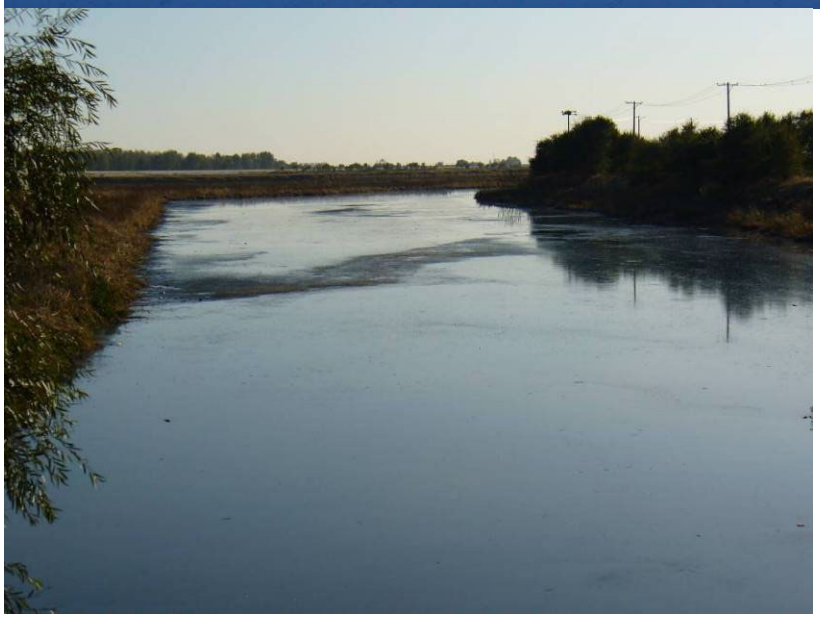
Annex 4 – Quinn Photos of Component Projects

South End of Phase 2 Labour Lake Project looking north. This is major bridge replacement included in project, south end.

Some of Labour Lake resettlement area along the western bank of the Lake moving north. Over 500 families and small businesses.

Highway between first large northernmost park and second park on Labour Lake, showing existing banks of lake.

Intake line and pump station feeding Labour Lake from Nenjiang River. Final picture is portion of Labour Lake already completed at University.



Raw sewage open inlet channel to lagoons with pumping station to WWTP1, and beginning of the lagoon system adjacent to WWTP1.

Main building and treatment units at Qiqihar Number 1 Wastewater Treatment Facility

Effluent discharge channel from Qiqihar WWTP 1 to Nenjiang River. View of proposed reuse site in part of lagoons south of WWTP1.

View of Proposed WWTP2 Site in Lagoon area east of WWTP1. View of Qiqihar center city 20km away, looking from WWTP1.

10. Harbin's Future: Notes on Urban Planning Possibilities

Douglas Webster[108] and Jianming Cai[109]
March 24, 2007

1. Introduction

This note is a product of the Ha-Da-Qi Corridor CDS process, a joint project of the Heilongjiang Provincial Government and the Cities Alliance/World Bank. We do not address the economy of the Harbin urban region, nor its overall strategic future, assessments that have been undertaken separately as part of the CDS SWOT and Strategy Options processes. Nor do we describe in detail Harbin's urban form; much has been written on this topic. Rather we address key city building issues facing Harbin Municipality and its urban Districts over the 2006-2020 urban planning period. (This plan has just been approved at the Municipal and State Council levels.)

This note is based on the assumption that Harbin will continue to prosper economically, as it has done since emerging from large-scale SOE layoffs and industrial re-structuring in the 1990s, and that it will increasingly face outward as the flagship city of Northeast China, and of the Ha-Da-Qui Corridor, slowly regaining some of its past pre-eminence, both economically, and as a cosmopolitan center. (Harbin has dropped from the top 6 to the top 100 category in urban GDP since the 1960s.) Harbin's new role will offer new opportunities in terms of city building related to access to more public and private capital, talented designers, etc. On the other hand, achieving the envisioned flagship role will require that the overall quality of the urban environment be improved, and that unique, functionally and thematically specialized communities be developed within the Harbin metropolitan area.

2. Harbin: Context

Harbin is a middle-sized Chinese city with over 3.6 million people living in the city proper, a relatively compact area of 293 square kilometers. It is a new city, initiated in 1898 as the north-east China headquarters of the Russian railroad, the Trans-Siberian line passed through north-east China in the late 19th and early 20th centuries. It prospered in the early Communist period, until its developed was hampered by both the "Third Line" and "Opening Up" economic phases, which favored other Chinese regions. Given this past prominence, followed by slow economic growth from the late 1960s to late 1990s, Harbin has a large number of Russian and Sino-Russian style buildings remaining. In addition to its architecture, the harsh winters (the time of the famous Harbin International Ice and Snow Festival), relatively cool summers, and a scenic hinterland of forests, mountains, and wetlands, contribute to its unique character. Given the city's economic revival over the last approximately eight years, opportunities are surfacing to improve the quality of the built environment, but simultaneously economic growth poses a threat to Harbin's built heritage as land in the urban core becomes more valuable.

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However, demographic growth remains in the city proper, and especially the Municipality as a whole, remains slow. The registered urban population of the city proper actually fell by .09% from 2000 – 2001, but has been growing slowly since then, e.g., at less than 0.2% annually between 2001 and 2003.[110] However, there is evidence that the population growth rate has accelerated of late, with the population of the city proper currently approximately 3.5 million. (Municipal authorities forecast a city proper population of 4.6 million in 2020, while the overall Municipal population will grow very little to 2020 because of rural net out-migration, some of it to Harbin city proper.) At the same time, the floating (unregistered population) living in the urban area has remained relatively constant over the last several years.

In sum, typical of mature industrial metropolitan areas, Harbin should plan on the basis of slow demographic growth. (The fact that Harbin's population is stable is actually a positive indicator, many mature industrial areas ["rust belt cities"] in Western Europe and the United States have lost ½ to two-thirds of their populations.)

3. City Building Issues

Key city building issues facing Harbin include:

3.1 *Lack of High Quality Neighborhoods*

Harbin lacks high quality neighborhoods, with high quality amenities and housing. At present, the most expensive housing is in the downtown near Central Street, while a new high-end area in the Aijian development near the Shangri-La hotel (the former railroad rolling stock manufacturing area) has emerged since that area was redeveloped starting in 2004. However, neither compares with high-end neighborhoods in most other large metropolitan areas in China. Such neighborhoods are needed to attract talent, provide lively venues for leisure, and help the city establish a distinctive and high-end image.

3.2 *Industrial Scatter*

Local officials worry that there are too many industrial estates and high technology zones – ranging from national level zones to District and County ones; at least 30 exist in the Municipality. In addition, there are numerous free-standing factories, particularly in Ping Fang District, which compounds the problem. The concerns include lack of geographic clustering of similar or linked activities, the fact that noxious industry often borders residential areas, and the fact that knowledge institutions are often remote from firms that could commercialize their innovations.

[110] Data Source: Heilongjiang Province data base prepared by Chreod Ltd., derived from Ministry of Construction Annual Yearbooks.

3.3 *Realizing the Potential of Heritage Buildings and Communities*

Harbin has been effective in protecting heritage buildings (through inventory, building markers, regulations, etc.); however, there is a realization that the full potential of Harbin's built environment heritage of unique buildings is not being realized as catalysts for neighborhood redevelopment and as tourist draws. This is particularly the case in Daowai District, which was the Chinese workers' area of residence and trade when Harbin was a Russian railroad company town. Daowai District is increasingly disconnected from the most dynamic economic vectors in the urban region.

3.4 *Rehabilitation and Use of Brownfield Sites*

In Chinese metropolitan areas nearly 80% of firms have been decentralized to surrounding peri-urban areas. In Harbin, as in the case of other previously slow growing metropolitan areas such as Tianjin, Chongqing, and Zhengzhou, industrial decentralization is less advanced. This is potentially an opportunity, providing land for reuse in the future that could significantly shape the city, provided the right planning (e.g., Floor Area Ratios) and market incentives (pricing of land) are in place. In sum, the large area in core Harbin still inappropriately devoted to industrial uses represents a significant land bank for reshaping the re-development of the city.

A related issue is the safety of brown field sites when they are redeveloped. Are proper guidelines and regulations in place to ensure safety to new users of former heavy industrial sites? (National regulations in this regard are not well developed.)

4. Urban Dynamics

4.1 As indicated in Section 2, Harbin is growing slowly in demographic terms. This means that there are real limits to the amount of land that needs to be urbanized, i.e., converted from rural to urban uses in the foreseeable future. Care needs to be taken not to overbuild or over-plan, especially on the periphery of the built-up area. Too much overbuilding can depress housing prices, and lead to leap-frog scattered development being "locked in" as urbanization rates fall in Harbin (and virtually all Chinese metropolitan areas) by mid-century cutting, off in-fill options.

There is evidence that overbuilding and over-extension of the metropolitan area is occurring in Harbin. For example, population densities in built up Harbin fell from 2039 persons per square km in 2000 to 1898 persons per square kilometer in 2003. Between 2000 and 2003 the "constructed" area of the city proper increased from 167.6 to 255.1 square kilometers, while the registered population actually fell (and the floating population stayed constant).

4.2 At present, residential and commercial development is most dynamic (exhibited in the highest property prices) in the: (i) Central Street area (highest housing prices are in the Central / Qiulin area) in Daoli District, (ii) new developments near the Shangri-La Hotel, e.g., Aijian, again in Daoli District, (iii) new urbanization across the Songhua River in Songbei District). A fourth node of emerging dynamism is in central Nangang District, including the old Russian core to the south-east of the Railway Station. Higher-end residential development is increasingly to the south-west and north (across the river). Knowledge institutions are also increasing their

presence along the south-west corridor as traditional industry is relocated further out on the axis (e.g., in the Taiping Airport Park) or to the South in the industrial areas of Dongli District. (For example, the Harbin Institute of Technology has taken over the old zoo.) Part of the attraction of the south-west corridor to knowledge institutions is the existence of the Yingbin National High Tech Zone, only 6 kilometers from the center of the city.[111]

Industrial development (aviation, automotives, etc.) is oriented to the South, in Dongli District, in both the National Level Haping ETDZ (the prime clsuter of FDI in Harbin), and in surrounding free-standing factories. This momentum of successful industry (both re-structured SOEs and other enterprises) locating to the south has resulted in the creation of a new national level zone by the Harbin Development Zone authority and the Dongli District, the Pingfan Industrial New Zone, which is formally a part of the Ha-Da-Qui Corridor development. This new zone will cater to automotives, aviation, metallurgy, pharmaceuticals, computers and parts, precision machinery, etc., as well as containing an executive park.

The East side of the urban region is increasingly stranded, including most of Daowai District. The east side of the city is both downstream and downwind in a heavy industrial region, not a desirable location, and so will be difficult to revive. The Huagong Petro-Chemical Zone in north Daowai District (the only refinery in Harbin) has negative impact on Daowai District's environment, further isolating Daowai from Harbin's economic revival. Binxi industrial zone in Nangang District is another low-end industrial zone, finding it difficult to compete with newer zones.

4.3 Although the quality of urban planning is high (there is a long and deep tradition of urban planning analysis in Harbin), there is a lack of investment capital to build high quality communities. Most property developers are local (although Shanghai developers have been at the forefront in the Aijian redevelopment); and there is an absence of world-class international property developers working in Harbin.

4.4 As noted above, a much higher percentage of land in the core city is occupied by old industrial buildings than is the norm for Chinese metropolitan areas. This is the product of Harbin's high reliance on manufacturing and the relatively slow decentralization of industrial enterprises to the peri-urban area.

4.5 In sum, Harbin is developing a strong north-south orientation to its development, with Sun Island serving as a green heart. The relocation of the Municipal Government to the north, plus large-scale residential development, and establishment of "clean" industrial bases, e.g., the Harbin State-Level Environment Protection Technology Industry Park, are driving development north of the river in Songbei District. Successful manufacturing industry is clearly moving south, while a south-west knowledge - high tech- aviation Corridor is gaining momentum. The East remains stagnant although plans for industrial re-structuring in the East will eventually shape the fate of the eastern side of the city.

[111] The Yingbin High Tech Park is approved by the Ministry of Technology and Science. It is 12.2 square kilometers in area, and is highly accessible being adjacent to the suburban (3rd) ring road and the airport motorway. It lacks significant FDI.

5. Needed Actions

Given our rapid assessment of spatial dynamics in the Harbin Metropolitan area, we suggest the following actions should be considered to address the above issues.

5.1 Given the relatively slow demographic growth, emphasis should be placed on building contiguously, including in Songbei District, not overbuilding in a scattered manner, especially in Songbei District. Demographic growth will not be sufficient, even if the Municipality's forecast of 4.6 million people in the city proper in 2020 is accepted, to justify widespread peripheral development in all directions. There is a danger that too much investment in peripheral development will deprive the core city, which is Harbin's major asset nationally and internationally, of adequate capital, and population.

Harbin should aim not to grow fast demographically, but focus on the quality of its economy and built form. Many relatively small metropolitan areas such as Frankfurt, Amsterdam, and Vancouver have global profiles based on the quality of their urban development.

Harbin is characterized by low housing prices. (The average price of new housing is 2,600 RMB per meter, and the high end of the market is 6,000 RMB; housing prices rank 24th in China among metropolitan regions.) Although low housing prices are good in that they allow easier access to the housing by low income households, too low housing prices deter quality developers from building quality communities, and make private sector led redevelopment of brown field and other areas difficult, or impossible. Excessive building through too fast release of land, especially in Songbei District, could exacerbate this situation of low property prices in the Harbin metropolitan area.

5.2 Typical of Chinese metropolitan areas, capital for city building is disproportionately allocated to new economic zones, of which there are approximately 30 in Harbin Municipality. However, Harbin is not a typical Chinese metropolitan area, its greatest assets are the old heritage areas, the downtown, etc., which appear severely under-capitalized. A mechanism needs to be developed that would create the equivalent of special area redevelopment status for these core city areas (as is done in many western countries) to attract national, provincial, municipal, and private capital, to enable them to compete with new economic and high tech development zones.

5.3 We see little prospect of reducing the number of, or consolidating *existing* special economic zones. (A Darwinian process is in effect whereby the best firms (highest value added, least polluting) locate in the national level zones, e.g., the three (four including the new Pingfang Zone) campuses of the Harbin Development Zone while less desirable firms locate in District zones, such as the Binxi Zone in Nangang District. We see the problem best addressed through incremental improvement as *additional* industrial space. The Municipality should play a greater role in delivering (or at least regulating) *new* industrial space, attempting to build fewer, but higher quality, carefully located zones. It appears this is already happening with the development of the new Pingfang Zone. As more high quality industrial land is put on the market, old zones will become relatively less important, and some can, perhaps, be redeveloped in the medium run. Others may attempt to improve their product, e.g., adding facilities, banning high polluting

enterprises based on the competition and demonstration affects of new high quality economic and high tech zone space. At the same time, no new free-standing factories should be allowed.

The process of industrial relocation to the peri-urban area (largely to the south: Haping and Pingfang) should be sped up by introducing incentive structures that encourage SOEs (and other firms) to move to the periphery, as soon as possible. This will have the triple benefit of: (i) reducing pollution in the core city, (ii) creating large brown field sites to catalyze the redevelopment of the core city (see 4.4 and 4.7 below), and (iii) supporting development of high quality industrial zones as described above. Proven methods to do this are being pioneered in China, e.g., Beijing, and have been successful elsewhere in the world. In essence, firms that move out should be given an equity stake in new development on the site that they abandon. This creates a win-win situation; the SOE that moves is likely to realize a large scale capital or equity gain, especially if their old site is redeveloped as a high end, high density nodal community, near subway service.

Local officials and outside observers note the lack of economic clustering in existing industrial zones in Harbin. This is true, e.g., noodle firms are next to state-of-the-art linear motor research and manufacturing facilities, while potential buyers of the motors are distant, but there is little that can be done in the short run. In the medium-run, market forces should lead to greater geographic clustering of economic clusters. Of concern is the lack of proximity of knowledge institutions and industrial space in some cases. Historically, brain power in Harbin was centered on the Harbin Institute of Technology and the Harbin Engineering University in central and eastern Nangang District, with industry being not too far away (to the south), in a relatively compact city. However, there appears to be an increasing spatial mismatch between some new suburban campuses (e.g., in Songbei District) and new high end manufacturing, e.g., in southern Dongli District. On the other hand, the development of the high-tech south-west corridor is a case of increasingly better alignment of knowledge institutions and some high-tech firms.

5.4 To develop high quality neighborhoods (outside historical areas), we see the need for (i) the Municipality to release larger plots and (ii) involvement of world-class property developers to raise the standard to which local developers would aspire.

Harbin Municipality should directly approach high quality developers, especially those with a track record in restoring heritage neighborhoods, utilizing “living culture” approaches. The Municipality’s past approach to high-end development was to hold design competitions; although to be commended, innovative concepts can only be realized by high quality property developers who can refine and operationalize the plans, and access large amounts of capital.

It would appear that the market for high end housing is promising in that the price of high-end residential property has been growing at approximately 12-15% per year over the last 3 years, while the average housing price increment has been 8% per year.

5.5 To preserve heritage neighborhoods (Harbin is one of 10 leading heritage cities designated by the Ministry of Construction), there is a need to implement a “living culture” neighborhood redevelopment model whereby developers would be significantly involved in rehabilitation, as in Xintandi in Shanghai, under very strict conditions, with interiors being utilized for appropriate

uses. Such a model would probably work in the Huayuan Street area (former Russian railroad headquarters, initial [1945] PRC headquarters), given its strategic location – being on the main north-south axis of the city, and close to the main commercial streets of the city. (There are 68 historical buildings in the Huayuan area, including 4 villa areas; the 7 square kilometer area was originally planned by the Russians as a garden city.)

The historical buildings in the Daowai District (1st to 8th Streets composed of Chinese, Russian, and Eclectic buildings) represent a greater redevelopment challenge because the area is outside the main vector of Harbin's spatial development, as argued above. There, many buildings are in danger of collapse. Although Ministry of Construction grants have been obtained to undertake minimal work in Daowai, they are clearly insufficient in terms of large-scale redevelopment. To reverse Daowai's "back water" economic image will be difficult given the many competing areas in the city attempting to re position themselves as high end areas. We suggest that the first step would be a Municipal effort that would concentrate on the best of the heritage blocks in Daowai, initially focusing on exterior cosmetics (e.g., painting), roadworks (e.g., cobblestones), low cost loans and tax breaks to individual owners who agree to rehabilitate buildings, local free (or low cost) design and construction assistance, etc. Eventually a momentum might be established whereby a larger scale public-private redevelopment initiative could be established.

5.6 Along the major heritage/commercial streets (Central and Guogeli) a first rate job has been done protecting heritage buildings. However, uses (interiors) are often inconsistent with the atmosphere that eventually should be achieved, e.g., Kentucky Fried Chicken outlets are found in classic Russian buildings. Over the long run efforts should be made to attract tenants whose functions (or at least interior design) are more in conformity with the Sino-Russian atmosphere that the Municipal and District planners wish to achieve.

5.7 Harbin has not been shaped by ring roads – as such the core is still strong and radial roads (8 major radial arterials) continue to significantly shape development. The suburban ring road (3rd Ring Road) is still not finished, while the outer ring road (4th Ring Road) is largely disconnected from the core urban system, serving agricultural, recreational, and satellite industrial areas.

Given this situation, Harbin should focus on creating high density nodes in the core city where brown field land (available for redevelopment) and subway stations coalesce. In these areas, very high FARs should be allowed in return for high quality design, establishment of public facilities, etc.

5.8 Harbin should take full advantage of its soon-to-be constructed subway system to revitalize the core. Areas within 400-500 meters of key stations will enjoy 25-35% increments in land and property prices (based on East Asian experience), essentially a "windfall" source of capital to create new nodes as noted above (4.7). Harbin has planned for 81.27 kilometers of subway line by 2020, and 197.9 kilometers by 2020; the first (red) line will be 14 kilometers in length, extending from the southern Harbin Development Zone (Haping Road), to the downtown, then will turn east, ending across the river. This first line will have a profound effect on the city's structure, reinforcing the north-south development orientation. (The second (blue) line will run east-west reinforcing the fast growing south-west corridor.)

5.9 Although Harbin is known for its unique physical environment and heritage neighborhoods, it has a poor reputation for environmental quality. The Songhua River is polluted (the State Environmental Protection Agency has identified 46 major industries dumping liquid waste into the river); however, to a significant extent this situation is beyond the Municipality's ability (even the Province's) to control. Nevertheless, improving the Songhua River's quality would greatly enhance the city's amenity attractiveness, especially as development north of the river increasingly makes the river a central artery of the city, rather than its northern boundary, as in the past.

Only 37% of the city proper is served by sewerage systems, this is below the norm for Chinese metropolitan areas and this issue should be addressed.

5.10 Plans have been developed for an arts/residential district on the north bank of the Songhua river to the north-east of Sun Island. This could serve as a high-end suburban community, balancing one or two high-end core city new communities that would incorporate heritage buildings, easy access to the core and rapid transit, etc.

5.11 Given the importance of brown field redevelopment in Harbin, the Municipality, in co-operation with the State Environmental Protection Agency should establish clear mechanisms and standards for the rehabilitation of brown field sites to ensure that future intermediate consumers (developers) and final users can be assured of their safety.

6. Summary

Harbin has enormous potential to become a high quality, compact medium sized metropolitan area, acting as the dominant and flagship city of Northeast China. Key to achieving this vision will be establishment of high quality neighborhoods, increased nodality, and more order order in its industrial zones. Aside from strong Municipal leadership, the Muncipality and its Districts will need to attract more capital, attract first rate designers, planners, and property developers skilled in heritage related development, and take measures to realize the potential of its brown field sites, if redeveloped, in the context of the new subway system.

Annex 1: Map Heilongjiang Province

Annex 2: Investment Climate in Harbin, Daqing, and Qiqihar

By Danchen Yu[112]

(Based on data from "Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China", World Bank, 2006)

While the focus of foreign and domestic investors on coastal China partly reflects local market size and coastal access, there is no reason why interior cities could not become more dynamic centers for domestic and foreign investment. Followed by the three economic zones of Yangtze River delta, Pearl River Delta and Bohai Bay, the Ha-Da-Qi industrial corridor, actively supported by the Central Government since early 2005, is a fourth development pole in China. The Ha-Da-Qi corridor is located in the Southwest of Heilongjiang Province along the Binzhou Rail line. It is headed by Ha'erbin and regionally encompasses the cities of Daqing and Qiqihaer, including smaller county centers such as Zhaodong and Anda.

To encourage further initiatives to facilitate investment in the Ha-Da-Qi corridor and outbound trade, this note summarizes some data from a recent survey of 12,400 firms in 120 cities in China, which included 300 firms in Ha'erbin, Daqing and Qiqihaer.

While not outstanding on every measure, Dalian is the clear leader among Northeast cities surveyed, in terms of a good investment climate. This makes it a useful comparator for Ha'erbin, Daqing and Qiqihaer. Shenyang, the capital of Liaoning Province, being another large heavy industry city on a large waterway in the Northeast of China, makes it another useful comparator. To get a broader view, we are also comparing Ha'erbin, Daqing and Qiqihaer with the city of Chongqing. Located in the central region of China, it has some characteristics similar to Ha'erbin, Daqing and Qiqihaer, being a large inland and industrial city.

Factor and transport costs. *(Table 1)* In terms of factor costs, the labor costs in Ha'erbin are only about 2/3 of the ones in Dalian, while real estate costs are close to 20 percent higher. The survey finds that transport costs clearly affect foreign investment and – to a lesser extent- firm productivity. Due to Ha'erbin's distance from the coast, high transport costs reduces Ha'erbin's cost advantage significantly, compared with the seaport city of Dalian.

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Table 1. RMB Costs for a "Basket" of Land, Labor, and Transport

City	Transport (1)	Land (2)	Labor (3)
Dalian	Negligible	10,556	14,061
Ha'erbin	***5,244***	***12,341***	***9,080***

(1) For interior cities, transport costs focus on the cost of trucking a 20-foot container to the nearest seaport, at a cost of RMB 6 per TEU-kilometer. The calculation further assumes that material inputs for each TEU would have to be trucked inland at the same cost. While rail costs are substantially lower, rail service takes longer and suffers from unpredictability, higher in-transit losses, and a complete lack of transparency during transit. Hence, for non-bulk cargoes, firms typically prefer to pay the higher costs associated with truck transport.

(2) Monthly rent for 1000 square meters of real estate

(3) Monthly wages for 6 full-time and 4 part-time workers.

Sources: Survey data; ADB report; World Bank transport report; and staff estimates.

Legal protections. *(Table 2)* Survey data indicate that firms in Chongqing (71%), Dalian (65%) and Shenyang (54%) have higher confidence that local courts will protect their legitimate contract and property rights than the firms in Qiqihaer (54%), Ha'erbin (50%) and Daqing (37%). This lower confidence may hurt the willingness of outside firms to do business or invest in the Ha-Da-Qi corridor.

Table 2. Expectations of Court Protection for Legitimate Contract or Property Rights (percent)

Chongqing	71
Dalian	65
Shenyang	54
Qiqihaer	***54***
Ha'erbin	***50***
Daqing	***37***

Infrastructure. *(Table 3)* Ha'erbin, Daqing and Qiqihaer compare favorably with Shenyang (0.9%) and Chongqing (2.5%), with losses of 0.6-0.9 percent of sales revenue from deficient power or transport among surveyed firms, while Dalian (0.5%) scores better.

Table 3. Power/Transport Losses, Relative to Sales Revenue (percent)

Dalian	0.5
Qiqihaer	***0.6***
Daqing	***0.7***
Ha'erbin	***0.9***
Shenyang	0.9
Chongqing	2.5

Access to finance. *(Table 4)* Access to finance is an issue for firms in most Northeast cities, with a few exceptions. While the survey indicates that while Dalian and Daqing have low bribe rates in order to get a loan for firms, small and medium size enterprises (SMEs) appear to have difficulties getting bank loans. This may however reflect the lack of such smaller firms in the two cities. Shenyang with the highest bribe rate (9.8%) reported by firms to get a loan, at the same time scores high on SMEs access to bank loans. This might further reflect a high corruption level in Shenyang compared to Ha'erbin, Daqing and Qiqihaer. With only a slightly higher bribe rate than the average of Ha'erbin, Daqing and Qiqihaer, but with a very high access rate for SMEs to bank loans, Chongqing might provide somewhat of an example for the banking sector on Ha'erbin, Daqing and Qiqihaer.

	Table 4a. Surveyed Firms Paying Bribes To Obtain Bank Loans (percent)	**Table 4b. Private SMEs with Bank Loans** (percent)
Shenyang	9.8	52.6
Ha'erbin	***6.8***	***6.9***
Chongqing	5	58.8
Qiqihaer	***5***	***32.4***
Dalian	2.1	0
Daqing	***0***	***0***

Government efficiency. *(Tables 5-7)* This encompasses the burdens from taxes and administrative fees; informal payments (i.e., corruption); and time spent dealing with government bureaucracy.

Taxes and administrative fees (relative to firms' value-added) tend to be high among surveyed firms in Ha'erbin (5.3), Daqing (5.2) and Qiqihaer (5.2), relative to Chongqing (5.1), Shenyang (4.6) and particularly to Dalian (3.1). Since taxes on domestic firms tend to be similar nationwide, locally-imposed administrative fees (e.g., for land use, construction, road transport, enterprise registrations) likely account for most of the differences. Fiscally-challenged cities may be more inclined to resort to administrative fees to raise needed revenues. One study by the Foreign Investment Advisory Service (FIAS) suggests that complex and ambiguous administrative fees can be a problem, especially in China's lagging regions.

Table 5. Taxes and Administrative Fees Relative to Value-Added (percent)	
Daqing	***5.3***
Qiqihaer	***5.2***
Ha'erbin	***5.2***
Chongqing	5.1
Shenyang	4.6
Dalian	3.1

While it would be pointless to ask directly about corruption in a survey, firm expenditures on travel and entertainment are a reasonable proxy measure for corruption. Dalian and Chongqing come out lower in terms of firm expenditures on entertainment/travel (0.7 percent of sales revenue) than Ha'erbin, Daqing and Qiqihaer. The lower expenditure on entertainment/travel in Dalian likely reflects greater administrative transparency, and possibly a larger presence of foreign firms in that city. Consistent with Table 4a, firm expenditures on entertainment/travel are relatively high in Shenyang (1.8 percent) and Ha'erbin (1.9 percent).

Table 6. Average Travel and Entertainment Expenses Of Surveyed Firms, as a Percentage of Sales Revenue

Chongqing	0.7
Dalian	0.7
Qiqihaer	***1.1***
Daqing	***1.1***
Shenyang	1.8
Ha'erbin	***1.9***

The survey also measured days-per-year that firms spend dealing with four major government agencies: Public Security, Tax Administration, Environmental Protection, and Labor and Social Security. In terms of time demands by these agencies, Dalian is surprisingly the worst performer among the selected cities, with an average of 91.4 days reported by surveyed firms. Qiqihaer (88 days) and Ha'erbin (79.5 days) also perform notably poor, while a much better situation is recorded for Daqing (49 days).

Table 7. Days-per-Year of Interaction with Four Major Government Agencies, by Surveyed Firms

Daqing	***49.0***
Shenyang	58.9
Chongqing	74.4
Ha'erbin	***79.5***
Qiqihaer	***87.8***
Dalian	91.4

Customs. (*Table 8)* Dalian, where survey respondents reported that an average of 6.7 days would be needed to complete customs clearance for a combined import-export cycle, has a significant advantage over the selected cities on this count. Customs clearance is reported slower in Shenyang (16.5 days) and faster in Chongqing (10.8 days) than the average level in Ha'erbin, Daqing and Qiqihaer (13.1 days). Given competitive disadvantages from being located deep in China's interior, it would be useful for Ha-Da-Qi, especially Ha'erbin (18.7 days), to seek to achieve faster customs clearance practices and standards.

Table 8. Reported Average Days Needed in Customs To Complete an Import-Export Cycle	
Dalian	6.7
Daqing	***8.1***
Chongqing	10.8
Qiqihaer	***12.6***
Shenyang	16.5
Ha'erbin	***18.7***

Competition and labor flexibility. *(Tables 9-11)* Economic activity in the Ha-Da-Qi corridor is likely distorted by the prominence of state-owned enterprises (SOEs). In contrast to the Liaoning province and Chongqing, where SOEs account for 61 and 52 percent of industrial sales revenue respectively, SOEs account for 81 percent of industrial sales revenue in Heilongjiang province.

Table 9. SOE Portion of Industrial Sale Revenue	
Chongqing	52%
Liaoning	61%
Heilongjiang	***81%***

Source: China Statistical Yearbook, 2005.

Relative to Dalian, Chongqing and Shenyang, surveyed firms in Ha'erbin, Daqing and Qiqihaer tend to suffer from lower capacity utilization and higher over-staffing. This may indicate a failure to exit non-profitable SOEs and labor regulation rigidities in the selected cities. SOEs that are unable to compete in terms of quality, flexibility, or after-sales service may end up competing only on price. This may hurt other, more competitive private firms and depress the overall investment climate.

Table 10. Capacity Utilization Among Surveyed Firms (percent)	
Dalian	83.83
Chongqing	83.59
Shenyang	80.81
Ha'erbin	***76.94***
Daqing	***71.25***
Qiqihaer	***75.09***

Table 11. Over-Staffing Among Surveyed Firms (percent)	
Dalian	1.2
Chongqing	2.7
Shenyang	3.6
Daqing	***3.6***
Ha'erbin	***6.3***
Qiqihaer	***6.9***

Skills and training*. (Table 12)* Ha'erbin has an advantage over firms in Shenyang, Dalian and Chongqing in terms of the average education of chief executive officers (CEOs) and frequency of university educated workers. This likely reflects Ha'erbin's traditional strengths in high-tech sectors. Qiqihaer and Daqing on the other hand have a lower education level in firms compared to Shenyang, Dalian and Chongqing. This might reflect a current industry profile with lower skill requirements.

Table 12. Workers with University Education (percent)	
Ha'erbin	***38***
Shenyang	31
Dalian	26
Chongqing	21
Qiqihaer	***19***
Daqing	***19***

Urban quality of life. *(Tables 13 and 14)* The survey data shows that conformity with environmental rules for disposal of industrial wastewater is highest in Dalian (97), along with Qiqihaer (97), while Ha'erbin is lagging on this count.

Table 13. Industrial Wastewater Disposals Meeting Environmental Standards (percent)	
Dalian	97
Qiqihaer	***97***
Daqing	***95***
Chongqing	93
Shenyang	93
Ha'erbin	***92***

According to the survey data, compared to Ha'erbin, the cities of Daqing, Dalian and Qiqihaer enjoy a better air quality, while Chongqing suffers a significantly worse one.

Table 14. Days With Good or Excellent Air Quality (percent of days)	
Daqing	***97***
Dalian	96
Qiqihaer	***88***
Ha'erbin	***82***
Shenyang	82
Chongqing	66

Overall. *(Tables 15 and 16)* Ha'erbin Daqing and Qiqihaer are naturally at some disadvantage vis-à-vis the coastal city of Dalian, which benefits from lower transport costs and higher per capita income at present. Based on the survey, estimates of the performance gains that could be expected from achieving 90th percentile attributes across the wide spectrum of investment climate factors used in this study, are shown in Tables 15 and 16 (for details see Annex 1). The expected performance gains are presented for both total factor productivity (TFP) (Table 15) and foreign direct investment (FDI) (Table 16).

Table 15. Expected TFP Gains from broad improvements in Investment Climate to 90th Percentile	
Qiqihaer	***0.76***
Daqing	***0.64***
Haerbin	***0.48***
Chongqing	0.47
Shenyang	0.45
Dalian	0.22

Table 16. Expected Foreign Ownership Gains from broad improvements in Investment Climate to 90th Percentile	
Chongqing	0.96
Qiqihaer	***0.90***
Haerbin	***0.83***
Shenyang	0.56
Daqing	***0.48***
Dalian	0.01

In order to attract more investment in Ha'erbin, Daqing and Qiqihaer, the high potential improvements for firm–level TFP (48-76 percent) and FDI (48-90 percent) strongly indicate a need for a better "investment climate" to be achieved, including the following (in rough order of priority):

1. More domestic and foreign competition in all transport and logistics sectors, including rail, to improve related service quality and reduce costs.

2. Near-term sale (or liquidation, as appropriate) of small or medium SOEs, which may distort competition and constrain private sector development.
3. Enforcement of labor regulations, reducing over-staffing, to improve remaining SOE firms' competitiveness.
4. Fewer administrative fees, with less complexity and greater objectivity for remaining administrative fees.
5. More reliable court protection for property rights and contract rights in the Ha-Da-Qi corridor.
6. Improved access by micro, small and medium size enterprises (MSMEs) to bank loans, through improvement of processes at bank branches in the Ha-Da-Qi corridor.
7. A one-half reduction in customs clearance times for Qiqihaer, a two-third reduction for Ha'erbin, and customs clearance times comparable to Dalian in Daqing.
8. Simplification of regulatory and administrative demands, to reduce the number of days that firms must spend with government agencies, especially in Ha'erbin and Qiqihaer.
9. Simplification and greater transparency in business registration, licensing, and inspections, in order to encourage business entry into the formal sector.
10. More attention to environmental protection and remediation, including the disposal of industrial wastewater (especially in Ha'erbin) and air pollution emissions.

Annex 1

Table 15 – Detail Data. Expected TFP Gains from broad improvements in Investment Climate to 90th Percentile

	Total Gains	Citychar1	Private2	Foreign3	Efficiency4	Lmkt5	Finance6	Hsociety7	Edutech8
Qiqihaer	***0.76***	***42.74***	***0.96***	***9.18***	***7.22***	***11.4***	***10.31***	***3.64***	***14.56***
Daqing	***0.64***	***16.79***	***0.31***	***10.99***	***22.73***	***6.69***	***24.22***	***1.95***	***16.31***
Haerbin	***0.48***	***39.53***	***3.97***	***11.94***	***25.19***	***16.41***	***21.35***	***3.72***	***-22.11***
Chongqing	0.47	28.29	2.62	13.22	16.23	6.62	4.49	10.48	18.04
Shenyang	0.45	35.81	6.98	7.44	29.52	9.24	12.71	4.53	-6.23
Dalian	0.22	43.96	21.42	-4.05	13.71	4.5	12.37	-0.43	8.53

Table 16 – Detail Data. Expected Foreign Ownership Gains from broad improvements in Investment Climate to 90th Percentile

	Total Gains	Citychar1	GovEfficient4	Lmkt5	Hsociety7	Edutech8
Chongqing	0.96	43.94	32.56	2.23	20.15	1.11
Qiqihaer	***0.9***	***41.7***	***38.88***	***6.69***	***9.8***	***2.93***
Haerbin	***0.83***	***22.54***	***51.99***	***6.55***	***10.08***	***8.84***
Shenyang	0.56	9.91	61.25	5.23	15.89	7.72
Daqing	***0.48***	***8.82***	***75.99***	***6.17***	***7.01***	***2.02***
Dalian	0.01	73.96	320.83	51.64	42.07	-388.49

Note: In Tables 15 – Detail Data and 16 – Detail Data, the "total gains" column indicates the expected percentage point gains from achieving 90th percentile attributes. The other columns report the percentage contribution to total gains from raising specified investment climate attributes to the 90th percentile.

1. City characteristics include per capita GDP, economic growth and transport costs.

2. Domestic private ownership share.
3. Foreign ownership share.
4. Government efficiency includes taxes/fees, bureaucratic interactions, time for customs clearance, and informal payments.
5. Labor market flexibility.
6 Access to loans.
7. Harmonious Society includes education, health and the environment.
8. Education and Technology.

Annex 3: URBAN ENVIRONMENT AND SERVICES REVIEW FOR NORTHEAST CHINA – Table of Contents of Full Report

FINAL SECTOR REPORT
VOLUME A – MAIN REPORT
C. LOTTI & ASSOCIATI S.p.A. – MOTT MACDONALD Ltd.

ABBREVIATIONS LIST

UER	URBAN ENVIRONMENT REVIEW
TOR	TERMS OF REFERENCE
FSR	FINAL SECTOR REPORT
WB	WORLD BANK
11FYB	11TH FIVE YEAR PLAN
HLJ	HEILONGJIANG
Lpcd	LITRES PER CAPITA DAY
UDIC	URBAN DEVELOPMENT AND INVESTMENT COMPANY
WWTW	WASTE WATER TREATMENT WORKS
EPB	ENVIRONMENT PROTECTION BUREAU
HEPB	HEILONGJIANG PROTECTION BUREAU
ADB	ASIAN DEVELOPMENT BANK
UTU	UNDERTAKING UNIT
RMB	RENMINBI (YUAN), IN THE FIRST HALF OF 2006 THE CONVERSION RATE HAS BEEN 1 EUR = 10.19 RMB 1 USD = 8.18 RMB

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Annex 4: HA-DA-QI Corridor Environmental Summary

By Larry Quinn[113]

1.0 Introduction to This Report

1.1 Quinn Mission 1 Objectives and Statement of Work

Through a grant from the Cities Alliance (TF055010 China: Economic Revitalization by Cities in Heilongjiang Province), Dr. Larry Quinn was contracted to provide a strategic review of the Qiqihar urban infrastructure needs and the development of a prioritized potential investment program. The World Bank is potentially interested in partnering with the City of Qiqihar in the improvement of their urban infrastructure in accordance with their planned 5-Year investment program, but support is subject to the agreement by center authorities of NDRC and MOF. The objective of the visit was to continue ongoing support to Qiqihar regarding its continued environmental strategy and related project preparation development as part of the Heilongjiang City Development Strategy (CDS) program, and to provide advice on the potential for international finance to Qiqihar. This work is outlined in the Statement of Work for Dr. Quinn's mission 1 as follows:

Statement of Work

> *The objective of the assignment is to provide technical assistance support to the city of Qiqihar in Heilongjiang province for their urban environmental improvements, in particular the water/wastewater aspects in the city. Dr. Larry Quinn (LQ) is to review the city's strategic environmental plans in the water and wastewater sectors, and advice on a strategic approach including enhancements and prioritization of proposed interventions. Most of the assignment time should be spent in Qiqihar through various visits. LQ will sub-contract interpretation services locally in the province as required and will report to the Bank's Task Team Leader (Mats Andersson) and upon your return from each of your visits to Qiqihar, and provide Qiqihar and TTL with summary notes of your findings and recommendations. The assignment is anticipated to be undertaken from October 2006 through September 2007. The timing of the visits to Qiqihar will be agreed with Qiqihar and the TTL visit by visit. The assignment is funded by a grant from Cities Alliance TF055010 China: Economic Revitalization by Cities in Heilongjiang Province.*

This mission was a continuation of work initially undertaken in a short mission by Dr. George Taylor, consultant to the World Bank and Mr. You Ji, World Bank Beijing Office in April 2006. As stated by their field visit report, the CDS Program would like to contribute to "strategic urban environment projects that facilitate and assist in the development of **high quality, financially sound and sustainable utility companies**." The objectives are to ensure that the **final plan represented the least cost or most cost effective solution to the relevant problem and would not be an unsustainable financial burden on local government agencies.** Technical and

[113] Larry Quinn, PhD, PE, Larry Quinn and Associates

financial evaluations are needed along with **rigorous EIA** reports and Resettlement Plans if it is applicable.

1.2 Quinn Mission 2 Statement of Work

During the time between October 2006 and June 2007, the Qiqihar city officials were to gather significant information requested by Dr. Quinn in October for further assessment. If desired by the Qiqihar officials, Dr. Quinn would use this information to develop a potential project package for funding by the World Bank or other loan/donor entity. The Qiqihar city officials apparently decided to pursue private financing of many these projects [depending on meetings to be held by Qiqihar in July, could pursue private financing for all projects] and the Statement of Work for the second mission was revised as follows:

> *Dr. Quinn will visit Qiqihar, Heilongjiang Province from about June 17 through June 30 to continue the assistance regarding the city's strategic water/ wastewater plan, review revised city documentation, and following the visit finalize and submit your final assignment report to the Bank. You will during the visit also review earlier environmental documentation by C.Lotti s.r.l. regarding four cities in Heilongjiang, and in particular: (i) summarize environmental aspects (in particular water/wastewater and solid waste) related to the Harbin-Daqing-Qiqihaer Corridor; and (ii) use, as you find appropriate, material in that documentation re. Qiqihar to enhance your final report. You will during the visit liaise with You Ji in the Bank's Beijing office, and with the TTL Mats Andersson.*

The findings of the Qiqihar review missions are shown in Annexes 1-4 attached to this report. This report responds to the second SOW for a more provincial review of environmental infrastructure needs for Heilongjiang Province based on meetings with provincial officials in Harbin. The environmental infrastructure needs of Heilongjiang Province are large, but provincial officials have not made any definitive decisions regarding the pursuit of international financing to meet these needs.

1.3 Ha-Da-Qi Corridor

The cities of Harbin, Qiqihar and Daqing form the Ha-Da-Qi Corridor. They are part of the "economic corridor", an area that the provincial government is keen to develop into an integrated productive unit. Planning horizons in the Clean Cities' studies were set at the years 2010 and 2020. The former coincides with the end of the 11th five year plan (11 FYP). As mentioned above, the more regional environmental characteristics of the Ha-Da-Qi corridor were presented in the Lotti/MM Urban Environment and Services Report completed in June 2006. It was found in the Quinn mission that the Chinese version of the Lotti/MM Report had not been widely distributed or reviewed, which made discussions on the conclusions and recommendations of the report difficult.

1.4 Acknowledgements

Dr. Quinn would like to express his sincere gratitude for the cooperation and assistance provided by the Qiqihar City and Heilongjiang Provincial Authorities during his missions to Qiqihar and Harbin. There was a very good level of cooperation amongst all parties and a proactive desire to

move a potential World Bank project to fruition. Dr. Quinn would especially like to thank Madame Wang of the Qiqihar DRC, Mr. Yin and Mr. Li of the Heilongjiang Provincial Finance and Economic Office, and Mr. Li Cai, his Qiqihar interpreter and Madame Zhang Chunxing, his Harbin interpreter.

2.0 Cities Alliance and Heilongjiang City Development Strategy (CDS) Program

2.1 Cities Alliance Grant, TF055010 China: Economic Revitalization by Cities in Heilongjiang Province

The proposal for the Cities Alliance grant funding was submitted in 2004 by Heilongjiang Province, and was sponsored by the Government of Italy. The project was implemented through the World Bank and the task manager was Mats Andersson, Senior Urban Management Specialist.

Supported by the Cities Alliance, the early city development strategy (CDS) activities in China (implemented by the World Bank) focused on economic development, regional integration, and financial management. A subsequent CDS program in China emphasized city-regional aspects, a participatory approach, and poverty mitigation. To achieve the highest possible yield for the development prospects of the northeast region, the proposed Heilongjiang CDS initiative builds upon lessons learned (positive and negative) from these previous China activities. It was designed to enhance the CDS impact in China as follows:

1. Further establish the CDS process in China among all levels of government as an effective vehicle for long term city and city-regional development in the country, by maintaining involvement of relevant provincial and national entities throughout this CDS implementation;
2. Further strengthen city ownership of the CDS process and its outcome, institutionalizing key processes in the participating cities;
3. Introduce good international practices for strategic planning and local economic development (LED);
4. Help enhance policies and modern approaches to urban environmental improvements - including land, water and air – based on an eco-systems and circular economy approach;
5. Contribute to knowledge about city and regional dynamics in rust belt conditions, and the related role of the private sector;
6. Apply a comprehensive, analytical, and action-oriented approach to support vulnerable groups in the cities, potentially including skills development and support for out-migration as appropriate;
7. Regarding infrastructure development, introduce new financial engineering instruments for the cities and the province; and
8. Disseminate important knowledge gained from this and previous CDS programs in China.

The Cities Alliance program assisted three cities in Heilongjiang Province – Harbin (the provincial capital), Daqing, and Qiqihar– to enhance the effectiveness, equity, and financial sustainability of their CDS with a focus on:

- Local economic development and industrial restructuring;
- Urban poverty alleviation, including issues related to unemployment, migrants, and women;
- Improvement of the urban environment and related public services;
- Establishing a regional economic corridor of Harbin, Daqing and Qiqihar; and
- Related investment programs and financial instruments.

This report summarizes the urban environmental infrastructure issues in response to the stated environmental objective as follows:

> *"It will enhance the existing eco-system and cyclical economy approach to the environmental management in the cities and city-regions"*

2.2 CDS Program of Ha-Da-Qi Corridor

The activities in the proposed CDS program were clustered into three Phases:

PHASE 1: September 2005 – January 2006

The process started with a two day kick-off workshop in Harbin with broad representation, to create a common framework and perspective for the program. Presentations would be made on: (i) City and Regional Strategy Development; (ii) Economic Revitalization Cases from Other Countries; (iii) Analysis of Vulnerable Groups; and (iv) Modern Eco-system and Cyclical Economy Approach to Environmental Management. This would be followed by consultations with provincial and local governments for: (a) a diagnostic of perceived key development issues and current strategies and plans; and (b) a thorough SWOT analysis of the substantive situation, including a related stakeholder workshop in each city. The workshop would also in parallel be followed by diagnostic studies of the urban poverty in the respective city. A parallel study funded by Italy on urban environmental aspects would have started field work by September 2005. These parallel studies would together with the SWOT analysis provide input to the subsequent policy analysis strategy development The outcome of the Phase 1 activities would be reviewed in December 2005 and guide the activities under Phase 2.

PHASE 2: February – December 2006

Specialized firms or individual consultants were contracted for detailed analytical work within an overall framework and approach for the initiative, which would have been defined with the province and the respective city during Phase 1. It is anticipated that studies would be undertaken in parallel on the following specific subjects:

A. Regional and local economic development and revitalization/industrial restructuring, and related growth prospects; specifically for the Harbin – Daqing - Qiqihar corridor concept (international & local consultants)

B. Unemployment / urban poverty alleviation (local consultants under guidance of Prof. Hussain)

C. Environment / eco-systems & circular economy (with support from UNEP, and in close coordination with the ongoing urban environmental study team (international and domestic resources) mobilized by an Italian firm)

D. Infrastructure finance (international as well as national consultants)

Phase 2 concluded with policy analysis and strategy development by the respective city, and at a provincial level for the corresponding economic corridor, based on input from the various activities mentioned above.

PHASE 3: January 2007

The program is concluding with a Northeast China level CDS workshop, where the province and participating cities would present the outcome in terms of their strategies etc. for discussion and for broader application in the Northeast. Phase 3 would also include other dissemination activities within and outside China, such as a specific knowledge sharing workshop in Beijing with national government entities (NDRC, MOF, MOC, SEPA, etc.), information sharing on various web-sites, and participation at relevant conferences.

2.3 Lotti/MM Urban Environmental Review, June 2006

This study was an "Urban Environment Review" (UER) and was funded by the Italian Consultant Trust Fund at the World Bank. It was prepared by the Joint Venture between the international consultant companies C. Lotti & Associaties and Mott MacDonald Ltd. This sector report was completed in June of 2006.

The Lotti/MM report used a basin water quality model and other tools to assess the potential effectiveness of proposed 5-year investment projects in the environmental infrastructure area. The study covered the cities of Harbin, Qiqihar, Daqing and Mudanjiang which are in Heilongjiang Province. Our focus is the first three of these cities in the Ha-Da-Qi Corridor. The objectives of the Lotti/MM assignment were summarized in the report as follows:

- Review the urban environmental issues
- Analytically review the strategy and plans
- Assess the short and medium plans for environmental investment plans
- Explore the range of financing and assistance options

Although the consultants had sent the report in Chinese to Heilongjiang earlier, no one present in the meeting discussions in Qiqihar or Harbin had any knowledge of its preparation, contents, or recommendations (other than Provincial DRC). A digital copy was distributed by the Quinn mission to both Qiqihar and Heilongjiang officials.

It was also noted in the Lotti/MM Report that Qiqihar has demonstrated a growing interest in the last few months for the study program of the World Bank, also regarding introduction of a "River Pollution Action Plan", focused on a few municipalities, which will be developed as an annex to the 11th five year Plan. The projects included in the river basin plan will be financed by Central Government funds for 40% of investment costs. Again, there was little feedback on this planning during the Quinn missions.

2.4 WB Missions To Qiqihar To Assist With Urban Environmental Infrastructure Review

The annexes to this report provide information on the current status of the environmental infrastructure projects in Qiqihar based on the Quinn reviews. There appear to be good candidate projects for potential international finance, with some improvements and enhancements recommended. Qiqihar is slated to make a final decision on whether to pursue international finance on these projects in July 2007.

3.0 Lotti/MM Report Details

Note: The following information in all sections of Chapter 3 was extracted directly from the C. Lotti/MM reports.

3.1 Overview and Coverage Area

The study covered the cities of Harbin, Qiqihar, Daqing and Mudanjiang which are in Heilongjiang Province. The cities of Harbin, Qiqihar and Daqing are part of the "economic corridor", an area that the provincial government is keen to develop into an integrated productive unit. Planning horizons in this study were set at the years 2010 and 2020. The former coincides with the end of the 11th five year plan (11 FYP).

The four project cities are located in the Songhua river basin. Although the cities under consideration are all in Heilongjiang province certain issues – in particular water resources and water quality can only be analysed at a river basin level, thus the project must consider interactions throughout the Songhua river basin which extends beyond Heilongjiang into Jilin and Inner Mongolia Provinces. The population of Heilongjiang is around 40 million while that of the Songhua basin is around 65 million.

Harbin is located downstream of the confluence of the Nen River and Second Songhua River which together form the Songhua mainstream. Two project cities, Qiqihar and Daqing are on the eastern side of the Nen river basin, upstream of Harbin. Both therefore have an influence on water pollution and water quality in Harbin. However Qiqihar is located on the banks of the river Nen while Daqing is more than 100 km from the main channel, connected through the complex network of rivers and lakes on the Nen Plain. Mudanjiang is on the Mudan river, which flows south north through more mountainous country and is a tributary of the Songhua mainstream river, joining some 400 km downstream of Harbin.

The climate of the study area is marked by cold dry winters and warm summers. Yearly rainfall is moderate with an average of 513 mm year in Harbin and 600 mm in Qiqhiar. Wettest months are in June July and August during which 70 to 90% of annual rain falls. The Songhua River has large floods mainly from summer rains rather than snowmelt. A large new reservoir (Nierji) went into operation in 2006, located on the Nenjiang River upstream of Qiqihar. This reservoir and other flood protection measures funded by the ADB have been implemented subsequent to a major flood event in the basin in 1998.

3.2 Key Environmental Issues Identified

River Pollution

River pollution in Heilongjiang is a major cause for concern. In Harbin, the issue of drinking water safety has drawn extensive attention after a series of water pollution accidents occurred on the Songhua River. All of the cities depend heavily on surface water in an area marked by extensive point and non point pollution. The water quality in Mudanjiang is compromised by industrial discharges upstream in Jilin province. The Songhua has poor water quality much of the time but is especially vulnerable during the winter dry season when flows are low and the surface is covered by ice, greatly reducing self-purification processes. The cold temperatures also prevent the correct operation of biological wastewater treatment plants in winter. It is one of the only major rivers in China that continues to show a deteriorating trend of water quality standards.

Diffuse Agricultural Pollution

Agriculture is generally considered as a source of diffuse pollution arising from the use of organic and inorganic fertilisers and pesticides on crops. In Heilongjiang the use of these is at similar high level to other provinces in China and is a significant source of pollution, particularly nutrients nitrogen and phosphorous which case eutrophication of water bodies. However there is an increasing threat to water quality posed by point discharges from intensive animal raising facilities, the rapid development of which is being strongly encouraged in Heilongjiang.

Air quality

The most representative parameter of urban air pollution is PM10, with Grade II air quality equalling 0.100 mg/m^3. The average annual concentration in the urban areas of Harbin is 0.113 mg/m^3. Reportedly, the use of coal for heating is a major factor in the high PM10 value. The planned extension of central heating will help in improving the air quality, but there are funding issues with current proposals. The monitoring network needs to be extended in points and parameters.

Existing urban services

Water supply infrastructure is generally adequate to meet the current demand. To a certain extent this is truer for Harbin and Daqing, while Qiqihar and Mudanjiang have some suppressed demand. The weaknesses identified were:

- Poor reliability of the water resource, particularly in terms of quality,
- Technical capability which often fails to meet the required water quality standards;

Comparison of operational data with similar utilities shows an acceptable level of productivity. Water losses do not differ substantially from other similar services abroad but are apparently high in some districts. However, by international standards the water utilities in the study area tend to be overstaffed. The operating cost of the marginal water quantity is much lower than the equivalent of the best international cases; this is most probably due to the low impact of labour over the operating expenses.

Waste Water

There is very little municipal wastewater treatment, and the 5-year plan for environmental infrastructure calls for the construction of 40 new WWTPs. The principal concerns noted by the Lotti/MM report were:

- Wastewater collection only covers limited areas served by water supply;
- Wastewater treatment capacity is not adequate to meet in full the present demand;
- There are technical sewerage and financial tariff problems causing existing WWTPs not to be operated to their design capacity.
- Sludge from WWTPs is not treated and disposed of in an appropriate way.

Domestic solid waste
Municipal Solid Waste (MSW) is collected daily from door to door. Waste is transported first to collection centres, from where waste is transported and disposed by landfill method. There are some landfill sites that are designd to international standards but most sites are not adequately engineered for permanent disposal. The capacity of the properly constructed landfill sites is much lower than the rate of generation as a result much of the waste is disposed of by dumping in inappropriate sites. Presently only the MSW generated in major urban areas is properly disposed of, rubbish in small towns and rural areas is incinerated in open piles or dumped inappropriately. The 5-year plan for environmental infrastructure calls for the construction of many new sanitary landfill facilities, but funding is not currenly sufficient for many of these proposed facilities.

Special attention is being paid by the Provincial authorities to special and hazardous wastes and specific projects are planned. Though not yet implemented they seem likely to solve the issues, if sufficient funding is committed.

3.3 Inventory of Urban Environmental Infrastructure

Overview
In Harbin drinking water safety issue has drawn extensive attention after a series of water pollution accidents occurred on the Songhua River. Currently there are two central water abstraction sources, one from surface stream and the other from shallow groundwater aquifer. Pollution of the two water sources has forced the city to divert water from a clean water catchment. An on-going Asian Development Bank (ADB) project is doing the first phase of this raw water diversion engineering.

Again in Harbin, over-exploitation of groundwater has resulted in a large area of depression cone in the aquifer. The pollution of aquifers tends to accelerate when lowered depth of groundwater is likely to draw in more polluted surface water.

Qiqihar is located on the Nen River from which it abstracts almost all the drinking water for its residents. As the city is on the high elevation plain, the groundwater yield is very low and seldom used for drinking water supply.

The river of Nenjiang is the receiving course of the wastewater discharge, about 45% from industrial source and 55% from domestic source in flow term and 28% and 72% from the two sources in COD load respectively. Thus the city of Qiqihar should develop a wastewater management planning in which it should sewer most of its residences by steps and construct urban wastewater treatment works.

There are a number of lagoons along the river of Nenjiang which are currently serving as the only means of domestic wastewater treatment for Qiqihar (as a type of oxidation pond). As Nenjiang is one of the rivers subject to the longest icebound period in China, these lagoons will not function effectively in the winter season. Though cheap to build the lagoons must be seen as a first step of treatment before more definitive infrastructure is implemented. However, it may be possible to improve the treatment efficiency of the lagoons in use while the long-term WWTP programs are implemented.

The environmental issues in the city of Daqing are mostly associated with the operation of industries. As the surface water resource is limited and not suitable for any production use, the industries tend to rely significantly on groundwater, leading to over exploitation of aquifers. Thus the water conservation and wastewater treatment in industrial sector may be of significant importance in the protection of water resource.

Daqing is located in an area of interlocking lakes, wetlands and small rivers more than 100 km from the main River Nen Channel. Large volumes of water are used in Daqing for pumping into oil wells to pressurise the reservoirs and push oil out to the surface. This demand places a strain on the local water resources but there is no requirement for this water to be of high quality and this represents a good use for recycling effluents.

Daqing EPB currently uses national standards for the discharge management. However, the self purification capacity of most of surface water bodies in Daqing area, which are mostly lakes, is small. As a result water quality objectives cannot be met in most of these surface water bodies when receiving the loading from discharges (including from WWTP), even though the effluent quality can meet its discharge standard.

Mudanjiang relies on the river as its main water source and waste waters are returned to it. However, the river water is already degraded when it comes to Mudanjiang from industrial uses in Jilin province.

The river quality indicator system as required by the national standards are primarily based on organic pollutants, such as COD, BOD and NH_3-N, which however can not representative of the pollution caused by industrial discharge. Toxic and hazardous pollutants, though included in the standards and regulations, are rarely monitored or controlled effectively by the environmental authority. As the river of Nenjiang provides the significant percentage of potable water to the residents, both the urban and rural, environmental monitoring capacity should be strengthened to regularly, more-widely and accurately monitoring the industrial pollutants. Corresponding measures thus can be developed based on the monitored results in order to improve the drinking water safety.

Diffuse pollution sources

The surface water pollution is significantly increased because of diffuse, or non-point sources. The use of pesticides and fertilisers in Heilongjiang is at similar level compared with other provinces in China. However Heilongjiang is actively promoting its animal farming activities. Some cities such as City of Anda and Zhaodong, along the Ha-Da-Qi Corridor, have their city-wide strategy to promote animal farming sector as a national level commercial brand. Such

expansion of the animal farming sector demands a concurrent review and improvement of the environmental infrastructure used in such facilities.

The major change in animal farming practice is the establishment of large, capital intensive, in-door facilities for raising livestock. The advantages of these are particularly clear in Heilongjiang where protection of livestock from harsh winter conditions allows dramatic increases in productivity. These "factory farms" produce vast quantities of solid and liquid animal waste. Besides being a continuous source of organic and nutrient loading to the rivers, they are also a large risk factor because sudden emptying of stored waste due to mismanagement or flooding. In addition to the organic and nutrient pollution, animal rearing facilities are a significant source of pathogenic bacterial and parasitic contamination and can become a critical disease vector.

Industrial Hazardous Waste

The current institutional arrangement for hazardous solid wastes disposal is a format centralized in provincial level. All municipal Environment Protection Bureau (EPB) within the province have to directly report to Heilongjiang Environmental Protection Bureau (HEPB) regarding hazardous waste management. The existing and any proposed facilities are to be controlled by provincial level directly through a newly established Heilongjiang Hazardous Waste Management Centre, which is one of the Undertaking Units (UTU) under HEPB. The Heilongjiang Hazardous Treatment Company is a dedicated enterprise, owning the Zhaodong Treatment facility. This institutional setting might be changed in a few years time, with the development of the business and management requirement, as stated by HEPB. It is also in need of additional finance.

Environmental Monitoring

There are two environmental monitoring agencies operating in parallel in the province of Heilongjiang. One is the Water Resource Bureau (WRB) which is responsible for monitoring the hydrologic data such as flow rate and rainfall as well as the ambient quality of water resources while another one is the Environmental Protection Bureau (EPB) responsible for monitoring the pollutants discharged by industry and present in the environment with a view to managing pollution and achieving environmental quality objectives.

River flow measurement is the responsibility of WRB, as is measurement of abstraction volumes and volumes of water supplied to industry. The WRBs also monitor water quality in the rivers and at points where the main drainage channels and sewers enter the rivers. Generally the WRB's collect far more information on water quality than the EPB but the activities of both organizations are not coordinated as necessary. Consequently is all too often impossible to correlate pollutant loads to water flow.

Both provincial and municipal levels of EPB have their own monitoring stations, which are doing the routine monitoring sampling and laboratory analysis. Currently the regular water quality monitoring exercise in Heilongjiang is limited to the organic pollutants such as COD, BOD and NH_3-N, that is not enough to fully investigate industrial pollution.

In terms of monitoring the following issues are most relevant:

- EPB inspectors have limited powers of access to industrial premises and much of the monitoring takes place "by appointment" by EPB units embedded in the industrial work unit. This system compromises the ability of the EPB to act independently and avoid the influence of local pressures.
- The environmental monitoring stations should be upgraded with their instruments and strengthened with the training for the air pollutants, e.g., VOCs.
- Limited environmental monitoring data and information is available in publications.

Status of water supply
By 2002, the percentage of population having access to tap water was 80.5% in Heilongjiang, and almost 100% in urban areas. The water supply design capacity is generally adequate to meet the current demand. The weakness of the sector is more in the poor reliability of the water source, particularly in terms of quality. Also, there are margins for a higher efficiency in the service that would make a better use of available resources.

Recurrent issues are lack / sludge treatment before disposal from both water treatment and waste water treatment and the level of operational capability of existing infrastructure.

Status on Waste Water Services
The waste water collection and treatment is composed of:
- Municipal wastewater sewers and waste water treatment plants (WWTPs);
- Industrial system with onsite treatment

In the municipal system in general is true the followings:
- Waste water collection rates are limited (usually to 60% of the services area);
- Treatment capacity is not adequate to meet present demand;
- Sludge from WWTP is not disposed in an appropriate way.

Harbin generates 434.6 Mm^3/y of wastewater of which 20% is estimated from industry. The Songhua River divides the old settlements south of the river from the new expansion north of it. South there are four drainage catchments with a total of 200 km^2 and a served population of 2.2 million people. Several new WWTPs are envisaged to cater for the demand. Also the north area is divided in four catchments for a total of 160 km^2. It is expected that this area will accommodate a substantial portion of the incremental population. In both areas expanded sewer networks need to reach the envisaged 95% collection rate at 2020.

Qiqihar generates 126 Mm^3/y of which 45% is from industry. The only WWTP is modern (2003) and well conceived, but does not operate at design capacity due to fiscal constraints. However its capacity is only for a quarter of the waste generated. The remaining quantity is partly treated (or stabilised) in a lagoon adjacent the WWTP.

Daqing generates 124 Mm^3/y of which 70% is from industry. The existing WWTP can treat 55% of the domestic and the remaining quantity is treated in lagoons.

Mudanjiang generates 180 Mm^3/y of which half is from industry. There is a recently built WWTP, with advanced treatment able to supply industry with re-cycled water. This plant however, was never put in operation.

Status on solid waste disposal
Municipal solid waste (MSW) is collected daily from door to door. Waste is transported first to collection centres, from where waste is transported and disposed by landfill method. There are some landfill sites that are designed to international standards but most sites are not adequately engineered for permanent disposal. The capacity of the properly constructed landfill sites is much lower than the rate of generation as a result much of the waste is disposed of by dumping in inappropriate sites. Presently only the MSW generated in major urban areas is properly disposed of, rubbish in small towns and rural areas is incinerated in open piles or dumped inappropriately.

The attached Lotti/MM table summarises the values of demand for disposal and quantities currently treated.

		Harbin	**Qiqihar**	**Daqing**	**Mudanjiang**
currently generated in PLC	t/y	9.190.000	2.660.000	1.710.000	1.760.000
currently generated in PLCUA	t/y	1.277.000	292.000	288.350	365.000
currently disposed or treated at PLC	t/y	1.880.000	340.000	220.000	380.000

Review Of 11th Five Year Plan Environmental Objectives
In HLJ Planning is done on the basis of five year terms, as required by the national law. Each municipal government prepares its own document on planning and development. The plan is multi sector and covers all aspects of the city development such as transport, development etc. The environment and related urban services is detailed in a specific section were the main quality parameter of air and water are detailed.

Each city plan includes a list that is likely to be turned into visible projects in the next five years. At this stage of planning there are only rough estimates of costs. Sometimes not even those are expressed and quantified.

The list is then screened and made homogeneous at provincial level. It is this level that approves the draft of 5 years plan. At this stage, the financial component is still rather sketchy. The draft is then submitted to IPA (Investment Promotion Bureau of Province Heilongjiang). The IPA is a public entity created in 2004. The IPA has a branch dedicated to cost estimate and study of financial implications of the projects. The IPA would then pass the total cost estimate to the Provincial People's Congress for final review and approval.

The IPA has also a branch for European affairs (IPA Division of European Affairs) that is in charge of finding funds for financing (or co-financing) the projects listed in the five year plan. The individual projects are normally complete with financial feasibility analysis, whose standard and content is rather variable.

Review Of 11th Five Year Plan Projects

This UER study focused on the project already proposed for inclusion in the FYP and related to environment and urban services. The selection is based on:

- Draft documents submitted by the cities to the HLJ government
- Documents on individual projects
- Lists of proposals received directly from the cities

It is noted that at early April 2006 only the projects related to the city of Harbin were approved at provincial level and there was a definite commitment towards their implementation. In the other three cities the list of project was still under scrutiny. In April 2006, the city of Qiqihar provided the Consultant with an additional list of projects that were duly taken into consideration by Lotti/MM.

The accident in Songhua River has spurred a series of initiatives. The Central government has promised additional funds for the river protection and at local level there is a re thinking about priorities that may lead to a different list of project to be included in the 11th year plan. However this is unlikely to change the essential part of the projects considered in the Consultant's financial analysis. The following table summarises the estimated investment cost by city and by sector. The selected list is reported in an Annex to the Lotti/MM report.

11FYP Investment cost related to urban services by city and by sector (Mill RMB)

Sector	*Harbin*	*Qiqihar*	*Daqing*	*Mudanjiang*	
Water supply	2.623,87	1.071,58		1.946,00	5.641,45
Waste water collection and treatment	1.937,50	2.451,79	170,00	293,00	4.852,29
Solid waste collection and disposal	1.496,47	1.317,24		139,60	2.953,31
Other environment related projects			170,00		170,00
subtotals	6.057,83	4.840,61	340,00	2.378,60	13.617,04

Wastewater sludge

An additional point to be considered in the 11 FYP is that the increase in wastewater treatment will result in the production of large quantities of wastewater treatment sludge. Depending on processes raw sludge will be between 98 and 95% water and will putrefy rapidly when stored. Before transport of further treatment the sludge will require dewatering and possibly some kind of stabilisation or treatment. Disposal of sludge to landfill can result in difficulties for the landfill management and also represents the waste of potentially useful resource.

Sludge may be processed by digestion to reduce its volume and, if anaerobic processes are employed, to convert much of the energy in the sludge to Methane gas which can be burnt to provide heat and electricity. Careful design of sludge management facilities to maximise the production of methane and electricity can significantly offset the operational costs of sludge processing. However the process is unlikely to become financially positive unless special payment can be obtained through the CDM carbon trading systems. The capital cost of efficient sludge digestion is of course higher than simply landfilling. Overall there is a need to investigate the entire sludge cycle, the chemistry of the wastewaters and the potential of different disposal routes so as to prepare a sludge management strategy for NE China.

Projected demand for solid waste disposal
Three cities envisage projects for expanding disposal of municipal solid wastes (MSW) for inclusion in the 11 FYP. The following table compares the future capacity at 2010 with the projected demand.

		Harbin	Qiqihar	Daqing	Mudanjiang
2003 total	t/y	9.190.000	2.660.000	1.710.000	1.760.000
2010 total	t/y	4.361.750	1.029.300	912.500	568.670
2020 total	t/y	7.489.800	1.268.375	1.250.125	700.800
present capacity	t/y	1.880.000	340.000	220.000	380.000
planned capacity	t/y	3.066.000	554.000	0	187.600
total future (2010) capacity	t/y	4.946.000	894.000	220.000	567.600
Capacity vs demand 2010	t/y	584.250	-135.300	-692.500	-1.070
Capacity vs demand 2020	t/y	-2.543.800	-374.375	-1.030.125	-133.200

3.4 Review and Prioritization of Proposed City and Provincial Urban Environmental Infrastructure Projects

The Lotti/MM report used three different approaches to rank and highlight different needs and expected performances. The ranking expressed by sector is useful to an analysis on a provincial basis. The same exercise can be repeated by City to optimize use of local funds and such details are provided in Volume B of the Lotti/MM study.

The analysis of priorities is based on the list of projects currently available. These projects are at different level of development and several lack details. Albeit the general values were cross checked or re calculated in this study, there is the need for further revision of priorities when details are available.

One fundamental issue concerns the content included in each project that my have components that may be worked and completed earlier than others (i.e. a pumping station before the network extension or a WWTP before extension of the sewer network etc). This kind of analysis is not possible at this stage but should be considered by authorities before committing to financing individual projects

Nevertheless, from the different approaches to priority analysis certain conclusions seem clear:

- The areas of greater demand for more services are Qiqihar and Mudanjiang. Here are areas were services are barely adequate or may become insufficient as soon as each city has any further development;
- Qiqihar is geographically in the upper part of the river basin and upstream other important cities. Their projects on water (better use of the water sources and better treatment of wastes) are more rewarding from the general environmental point of view.

In this sense the ranking provided by the multi-criteria analysis and by the river quality modelling are the best guide. (The two approaches give essentially similar result for the wastewater sector).

However, in a view of general regional development of environment quality and services the project proposed by Harbin shows a high level of profitability. They have to be pursued not only because they are good in themselves but also because they can generate financial resources that could be re-invested in the sector. To make this possible, however, suitable changes have to be implemented in institutions or by extending the area of service of utilities to allow the redistribution of resources.

The 11 FYP require a substantial amount of investments in infrastructure. Only some of the projects are self financing and are mainly related to water supply. There is scope for international loans and credits, but institutions such as World Bank need to be involved through central government, so individual plans and projects need first to pass the internal approval procedures.

There is scope for private sector participation. Successfully attracting and securing long-term private capital in environmental projects depends on the simultaneous development of a number of institutions, including creditworthy local governments, independent regulatory agencies, and deeper and broader local capital markets.

The carbon fund (CDM), an important policy instrument embodied in the Kyoto Protocol, is designed to generate both cost-effective greenhouse gas (GHG) control and sustainable development benefits for host developing countries. The CDM will channel private-sector investment into emissions abatement projects in developing countries. Heilongjiang province presents several opportunities for developing CDM projects. A possible example is the recovery of biogases from wastewater treatment plants' sludge and production of energy for use either in the plant itself or for sale to the grid.

A few broad conclusions were drawn ini the Lotti/MM report from the limited but growing number of projects that have been structured with private capital:

- Government political and financial commitments are essential;
- A contractual and regulatory structure that minimizes uncertainty and provides both flexibility and consistency in renegotiation and operational autonomy is required;
- Transparent competitive tendering is an important tool with which to generate information on asset values, tariff levels, and qualified operators;
- Full-utility concessions and asset sales provide the broadest scope for operational and financial improvements;
- Where full utility concessions and asset sales are not possible, BOT/BOO constitute a second best model of operation. Although they shift the responsibility of financing and operating the facilities to the private sector, they do not and cannot address a utility's fundamental operating deficiencies and thus are not capable of transforming financially weak utilities into strong ones.
- Where concessions and asset sales are not possible, utilities can be corporatised or operations and management contracts awarded to improve services and revenue streams in preparation for privatization.

Of these the corporatisation of the utilities is a route that can provide many benefits for efficiency and accountability even without privatisation as a short or even long-term goal.

Risk Analysis

The historical review and river basin water quality analysis has established the scale of the issues and identified the key risks for the water sector. These are:

1. Acute pollution on the Songhua incidents rendering the water resource unusable as a water supply for short or possibly for extended periods;
2. Gradually increasing pollution from urban, industrial, rural and agricultural sources outpacing the investment in water treatment

The mitigating strategies for risk 1 are:

- Develop alternative water resources for key cities such as Harbin, which are not reliant on the Songhua River for abstraction. If using groundwater ensure that sufficient resource is available of reasonable quality;
- Improve the infrastructure of the water supply network in the cities so that they are still able to distribute water to all customers (if only intermittently) even if one or more of the abstraction points are affected by pollution.

For mitigating risk 2:

- Undertake full studies of water quality in the Songhua Basin to quantify the contribution from each source of pollution and develop strategies for managing pollution.
- Strategies may include: Strengthening river basin planning authorities; Coordinating data sharing between management authorities; undertaking Industrial pollution control action plans; strengthening management of diffuse pollution.

The management of discharges from livestock farming is a serious but poorly understood or managed risk. It is particularly challenging because the discharges are spread very widely around rural areas where it is very difficult for the central authorities to monitor and enforce compliance with regulations.

As well as considering revisions to the existing water supply and wastewater collection fees and revenue collection modes, the Lotti/MM report recommended consideration be given to these specific issues:

1. **Transparency and consistency of revenue sources** is a vital component of raising investment finance on good terms. Ideally a tariff system should be set at a level that allows a self financing operational system, if this is not possible to achieve immediately, then where subsidies are made the rules for these should be clearly agreed and declared with a time bound action plan for tariff reform showing the continuance or phasing out of such subsidies.

2. For the management of sewer systems and wastewater treatment works it is vital to **know the composition of industrial discharges to the sewers**. Some high strength discharges can represent a hazard to the structure and operational safety of sewer systems and can incur difficulties and additional costs at the treatment plant and for sludge disposal. If the water company works together with the EPB on the management of the register of discharges and issuance of permits then local procedures could be put in place for

charging for discharges to sewers on a basis proportional to the pollution load and treatment costs rather than a fixed charge per cubic meter. Invoking the polluter pays principle this can provide an additional source of revenue and also provide the enterprises with strong motivation to consider investing in cleaner production technology or their own onsite treatment processes tailored to the specific characteristics of their discharge.

3. The **structured charging for discharges could become a mechanism for implementing total load control**. This is currently required under existing legislation but the implementation methods are very unclear. Within such a mechanism it may be possible to incorporate load quota trading which would provide a strong theoretical mechanism for optimising pollution control investment – however without much stronger monitoring, planning and enforcement such mechanisms could not work in reality.

4. Current legislation and **total load management does not take account of diffuse pollution**. This study has demonstrated that this is a very important factor in river water quality planning. The provincial authorities should work with the national authorities to acquire data and plan how this is to be incorporated into the water quality management regime.

5. **Performance based targets** – i.e achievement of river water quality targets - would provide an incentive to consider abatement of all pollution sources on a least cost basis when developing investment plans. The current action or capacity targets are prescriptive and can lead to non-performing investments.

Waste Water Sector

The ranked list in Annex 2 to the Lotti/MM report provides guidance for priority for project implementation in the wastewater sector. Beside it the following recommendations apply:

1. This study has illustrated that it is very important to **plan at a regional level**. Water quality is an issue that can only be successfully addressed through river basin planning, It is helpful to look forward and make realistic predictions of the trends in environmental performance in the future so as to know the scale of intervention required and the major risk factors to be addressed. Policies and strategies may then be planned for managing these risks.

2. Increasing **pollution from diffuse sources of livestock farming** is a major risk factor for future water quality. The control of this pollution source should be investigated in detail and management methods, regulations and enforcement developed.

3. **Industrial discharges** should be studied in more detail and consideration given to preparing a basin wide industrial pollution control action plan. The modelling methods used in this report may be applied to assessments of industrial pollution.

4. Further investigations should be made into the **key sensitivity factors** highlighted by the modelling process, such as livestock pollution loadings, livestock growth rates, rural

population per capita loadings, seasonal flow variations and industrial pollution control strategies.

5. **Sharing and publishing of data between agencies** – especially between MWR and EPB - would greatly enhance the capacity of all stakeholders to understand and manage water quality in the River Basin.

6. As well as WWTP investment and industrial and agricultural pollution control, the **effectiveness of the discharge and abstraction permitting system** as a pollution control tool should be examined. Integrating abstraction and discharge planning between agencies and understanding the pollution impact of each permit on the whole river basin could provide an effective mechanism for planning and pricing polluter pays systems.

7. When planning water resource schemes the **security of the quality of water source zones** is of great importance. Applying river basin water quality modelling principles as demonstrated here can allow planners to understand the impact or benefit of schemes in terms of ensuring that sections of river designated for water abstraction are protected.

8. The **discharge standards applied to WWTP** should be appropriate to the environmental issues faced. There is no point trying to achieve the very stringent national standards for nutrient removal if eutrophication is not a major issue and if significant benefit cannot be demonstrated for the additional investment required.

9. It is estimated that the existing wastewater treatment works in 2003 had around 425,000 m^3/d of **capacity not being utilised** (of which 255,000 m^3/d capacity in Jilin). To provide new capacity of this scale would cost around 600 million RMB. It should be a target to construct the necessary sewerage and operational systems to utilise this capacity. There is a risk inherent in the widely publicised incentive for municipal authorities to achieve a certain percentage of sewage treatment capacity that the outcome may be that rewards are for providing capacity rather than utilising it. Consideration should be given to incentives based on environmental improvement outcomes rather than construction actions.

10. **Planning in the water sector requires a basin wide approach**, decisions on the allocation of abstraction and discharge rights and the targeting of investment have implications not just on downstream users but also on upstream users who may have to bear the costs of providing treatment to protect those downstream or have to limit their water use to leave resources available downstream. Both planning and operational procedures need to reflect the interconnectedness of users of a river basin.

Solid Waste Disposal Sector

The provision of municipal solid waste collection and disposal is largely a matter for individual cities; coordination is required only for the setting of standards, performance targets and possibly funding mechanisms.

Hazardous waste management requires some regional coordination as one facility can serve a large area.

The ranked list in Annex 3 of Lotti/MM report provides guidance for priority for project implementation in the solid waste sector. The following recommendations apply:

- The projects currently envisaged do not look adequate in size and extent to cope with the demand. Demand is likely to grow substantially in the near future
- The engineering of disposal sites needs to be improved to a common standard that includes full treatment of leachate and recovery of methane landfill gas.

Air pollution Sector

For air pollution the solutions are partly of a national / global nature but otherwise a local matter of enforcing regulations and managing the transition to less polluting activities. Central heating projects reportedly improve air quality in the cities during winter periods.

3.5 Priorities And Strategies For Each City

Within each city the implementation of the different projects should balance necessity with financial resources. In this sense the ranking expressed in terms of multicriteria (in Annex 3 of Lotti/MM Report) offer guidance for priority among different requirements.

The Lotti/MM Report did not review the technical details on a widespread basis, many projects are still in the early stages of the conception. However, it is possible to make remarks on the implementation of the schemes. In the following sections the projects are reviewed by city and by sector in order to give specific comments on the engineering and on the further steps that should be taken.

Harbin

Water supply: the projects included in the 11FYP are all viable and necessary to satisfy future demand. The project of Mopashan phase 2 completes an important scheme already in progress and will provide an alternative to Songhua river based sources. As well as reducing risk and improving security of supply this project also shows a high financial internal rate of return and it may help in generating new financial resources.

However, to fully exploit its potential the distribution system in the urban area should be able to move volumes of water from south (were the Mopashan scheme is ending up) to north and north east, were the present source is located. Also, the network needs to be maintained at the optimum level of efficiency. In this sense it would be good if a project of renovation and improvement of the distribution system is included in the 11FYP.

The other water supply projects in Harbin area include:

- Planned water works expansions to supply new urban development and other centres.
- Planned pumping stations and interconnection infrastructures

Waste water: all projects included in the 11FYP are viable and needed to cope with the existing and projected demand. The projects “Xinyigou chemical WWTP”, “Hejiagou WW interception

project", "Harbin Electroplating industry park WW treatment center", "Harbin General Pharmaceutical Plant water reuse project" show financial internal rate of return over 3%. However, there are engineering details that may bring in optimal design of the scheme. The 11 FYP includes one WWTP for each catchment basin. However, the area is flat and it is in principle possible to reduce the number of WWTPs by joining two or more adjacent drainage districts with suitable conveyors. Feasability studies should explore the operational and financial advantages of centralised treatment – such studies should pay careful attention to including the long term energy and operational costs of pumping with particular consideration of pipe diameter / cost / friction issues.

Solid waste projects show poor economic indicators, yet the planned ones are barely adequate to meet demand. Among them the incinerators and treatment for special wastes should have a priority for they serve a wide area. Again attention to engineering details of the collection system and of the land fill sites will reward in future with a longer useful life.

Qiqihar

The water sector is of primary importance and should have priority. The planned projects need to be implemented to increase water production. However, the plan does not include a project for a distribution system renewal and the introduction of water conservation measures without which it would be difficult to match demand and the benefits of increased production would be partly off set by increases in water losses. Among the water supply projects the only one to show a positive internal rate of return is "Rebuilding, expansion project of water supply in Nahe city".

The new WWTPs included in the plan rank at the very first positions in the cost benefit analysis and in the multi criteria analysis. The model has shown that this is the area were more rewarding results are obtained for the environment. This is understandable in consideration also of the high environmental value of the wetlands close to the city and in the use of water from Nen river (and hence from Songhua mainstream) downstream the city.

The waste water treatment is today partly relying on lagoons, as primary stabilisation. This is not an optimal solution and ultimately lagoons need to be replaced by proper WWTP. However, as temporary solution they offer at least a primary treatment that works during warmer months.

There are other projects concerning the rehabilitation of lakes and water bodies in or close the present urban area. These projects should have lower priority than the overhauling and extension of the waste water collection networks and optimal treatment of wastewater. There is no point in dredging lake sediments until all ongoing inflows of pollutants have been addressed. From the financial point of view these kinds of projects do not create revenues and are justified only within the framework of urban development.

Daqing

Daqing does not include projects for water supply and in term of investment in infrastructure this is probably correct given the involvement of local industry in water provision. However, here is a case for revising the institutional arrangements of the water service by introducing an effective water regulator.

The urban waste water treatment project is ranked high in the cost benefit and is recommended. In fact even if financial internal rate of return is negative, the economic analysis which states the benefit for the community gives high level indicators.

The other projects envisaged for inclusion in the 11 FYP are somewhat less urgent for the same reason as expressed above for the similar lake improvement projects in Qiqihar.

None of the projects planned in Daqing show a positive financial internal rate of return, this strengthens the case for modifying the level of tariffs.

4.0 Suggestions for Integration of Urban Environmental Management Issues

4.1 Water Resource Management and Water Quality Management - Regional

Similar to all river basins in China, the management of water resources in the Nenjiang and Songhua River basins suffer from institutional roles of the Water Resources Bureau and the Environmental Protection Bureau. An emerging model in China is allowing for more Integrated Water Resource Management (IWRM) techniques to begin to bridge the gap between water quantity and water quality management roles.

The local Water Affairs Bureaus operate at municipality level under regulations drafted by the MWR following administrative reforms in 1998. These cover water resources planning and management as well as domestic water supply and irrigation. The WAB and its county level subsidiaries are responsible for issuing abstraction permits and collecting the water resources tariff. Several articles in the regulations provide for demand management measures such as installation of water meters and payment by volume.

The Environmental Protection Bureaus are responsible for environmental planning, pollution control, monitoring and reporting on environmental quality. The Bureau of Land and Resources is responsible for the protection, management and development of land and natural resources. It regulates land use and transfer of land use rights through the maintenance of a land use register. It carries out geological investigation and mapping. The Construction Bureau is responsible for medium and long term urban planning, giving guidance on urban water supply, sanitation and the environment. The PAO monitors levels of poverty, prepares and implements poverty alleviation plans and coordinates activities with other agencies.

The use of expanded IWRM tools would allow the implementation of improved water management to jointly address water resource quantity and water quality issues. Some of the typical critical issues found in most parts of China that could be improved include:

- Water shortage: The rural population exceeds the carrying capacity of the land under rainfed agriculture, especially during increasingly frequent droughts.
- Drought crisis management: The impact of drought has increased over the last 20 years or so, but there is no inter-agency drought crisis management plan.
- Growing demands: Water resources use continues to rise very quickly.
- Water supply: Increased supplies and improved treatment and distribution.
- Reservoirs: Including multi-criteria purposes related to quantity and quality issues.
- River pollution: Integrated abstraction and discharge permitting processes can help.
- Irrigation: Improved efficiencies.
- Shallow groundwater: Alluvial groundwater pollution.
- Water charges: Low charges do not cover operating costs and no funds are available for rehabilitation and maintenance.
- Water saving measures: Irrigation and industry need improved water saving measures, while few households are equipped with operational water meters enabling them to use water economically.
- Monitoring: There is very little measurement of abstraction and inadequate monitoring of water resources, particularly groundwater.

- Regulations: There are many regulations drafted, but few are implemented enforced.
- Integrated planning and management: Water resources planning and management needs to be comprehensive and basin-wide, implemented in partnership with other agencies and carried out locally.
- Delegation of management responsibilities; and
- Improved Stakeholder consultation and participation.

4.2 Water Supply Planning and Wastewater Collection Issues and Management

The planning for expansions and improvements to the municipal water supply systems must be done in accordance with a concurrent study of the drainage and wastewater collection systems necessary to handle these new and improved water supplies. Yet, the management of the water supply systems and the drainage and wastewater collection systems are handled by different municipal authorities and this concurrent planning is not always evident. In addition, the increased wastewater flows in the collection systems must be planned for by the downstream wastewater treatment authority, and this concurrent planning is again often absent or minimal.

4.3 Industrial Pretreatment and Wastewater Collection and Treatment Systems

The control and charging of pollutant loads from industries to municipal sewerage systems under a rigorous pretreatment system is a major need in most cities. Although the major industries usually have direct wastewater discharges rather than being put into the municipal sewers, even very small industries can have major deleterious effects on the municipal sewer system and the downstream WWTP.

In addition, the wastewater collection system requires a rigorous program to ensure that infiltration and inflow are not entering the system and that leakage is not occurring from the system. This requires extensive monitoring and management programs, and these are not evident in most cities.

4.4 Enhanced Technical/Fiscal Planning for Wastewater Collection and Treatment for Maximum Environmental Benefit at Least Cost to Cities

The issues of planning and management of the entire wastewater program requires a systems' analysis of all aspects of the program, from generation to pretreatment to central sewerage to wastewater treatment to effluent disposal options and sludge disposal options. Proposed projects that emerge for wastewater management on any aspect of this system must recognize impacts to all other aspects and be developed under a "least-cost" solution to maximize overall environmental benefits at the least amount of cost to local citizens. In most cases, the projects in the cities are formulated in a rather stovepipe fashion for only one part of this overall system and without sufficient integrated analysis of least-cost solutions to the entire program.

4.5 Wastewater Treatment Sludge and Solid Waste Management

The construction of scores of new WWTPs in Heilongjiang Province will generate a significant amount of wastewater sludge that will require an environmentally-benign disposal system. Since the control of industrial discharges to the sewerage system is not usually controlled to the degree to ensure the quality of the sludge for agricultural purposes (a good long-term goal once the pathogenic and toxic constituents can be controlled to acceptable levels), landfilling is usually

the preferred method of sludge disposal in the interim. However, planning for new municipal landfills in Heilongjiang is moving slowly and there is no evidence that this new sludge loading has been taken into consideration.

4.6 Solid Waste Management and Urban Environmental Amenity Projects

As mentioned previously, the planning for new municipal solid waste facilities in Heilongjiang appears to be moving somewhat slowly. In the meantime, cities such as Qiqihar are implementing urban environmental amenity projects and the improvement to the overall municipal waste disposal issue would go a long way to improve the environmental appearance and health of the municipal areas.

4.7 General Water Pollution Management and Urban Environmental Amenity

The previous chapters have illustrated that water pollution control in Heilongjiang will require an integrated management of municipal and industrial discharges, but also the management of diffuse sources of water pollution in both the urban areas and the rural areas. An example of the need for integrated planning is the urban environmental improvement project of Labour Lake in Qiqihar where significant funds are being expended on improvements to the surrounding areas of the Lake, but the water quality of Labour Lake is not being studied for improvements to hydrologic conditions or environmental management of diffuse pollution sources to the Lake. It would seem logical that an urban environmental improvement project should actually improve the water quality of the resource that is being used as the centerpiece for improvements.

4.8 Environmental Incident Management and Warning Systems

The integration of pollutant discharge data and water resource management systems (especially the new flood warning systems) could assist in mitigating downstream problems and improve response times after a major pollution incident (such as the recent problem in Harbin from the Songhua River).

5.0 International Assistance for Environmental Infrastructure

5.1 Definite Needs Identified for Additional Environmental Infrastructure

After the major flood event of the late 1990s in Heilongjiang, provincial authorities have been taking definitive actions with international assistance to improve the flood control system in the Nenjiang and Songhua River basins. Based on the Lotti/MM environmental review and the recent water pollution problems in Harbin, it would appear to be a good time for the provincial authorities to develop a similar strategy for environmental infrastructure with international assistance. The Lotti/MM reports and the other World Bank missions under the Clean Cities program have identified a wide variety of environmental infrastructure needs, most of which are based on the 5-year plan for environmental protection.

5.2 Basin-Wide, Sectoral and Corridor Level Analyses of these Project Needs Should Be Assessed with a Strategic Environmental Assessment to Produce the Most Environmental Benefit for the Investment Levels Available

Strategic environmental assessment (SEA) has been emerging worldwide and in China as a method to assess large sectoral or regional issues such as environmental infrastructure needs. A Heilongjiang environmental infrastructure SEA could expand on the Lotti/MM analyses based

on improved modeling of the river basin and a more detailed review of proposed project characteristics to rate and rank the 5-year projects that could produce the greatest environmental benefits to Heilongjiang. Although the province has good intentions of financing the entire program of the 5-year plan, this is really a long-term program that is not likely to be fully implemented in this 5-year period.

5.3 Institutional Barriers within Cities and Within Provincial Level Authorities Need to be Reduced as Part of these Integrated Approaches

As outlined in previous sections, the implementation of IWRM techniques requires that the stovepipe institutional responsibility framework for water and environmental management in Heilongjiang start to breached. This is necessary both for the overall improved management of the water resources and other environmental assets of Heilongjiang Province, but also to allow for the formulation and implementation of improved environmental infrastructure projects, with maximized environmental benefits.

5.4 Proposed Loan Package Projects Do Not Necessarily Have to be the Highest Level of Need Under This Analysis But They Should at Least Be in Upper Echelon of Need

Once a process such as SEA or similar has improved the formulation and ranked the benefits and cost effectiveness of proposed environmental infrastructure projects, the projects proposed for international financing do not necessarily have to be the top projects as they may already be implemented with national or local resources. It is necessary to merely show how any projects proposed fit into the overall scheme of financing and how the proposed projects complement other activities already being implemented by Heilongjiang Province from other sources.

Annex 5: METROPOLITAN GOVERNANCE IN CHINA: PRIORITIES FOR ACTION IN THE CONTEXT OF CHINESE URBAN DYNAMICS AND INTERNATIONAL EXPERIENCE

By Douglas Webster[114], Jianming Cai[115], and Chuthatip Maneepong[116]

EXECUTIVE SUMMARY

Objectives and Rationale

In the context of international learning and Chinese urban dynamics, key issues facing Chinese metropolitan areas, and priorities for action to improve metropolitan governance are identified.

Improving metropolitan governance in China is important because: (i) Current inefficiencies mean that large gains can be realized quickly, e.g., irrational routing of trunk infrastructure to stay within local jurisdictions, proliferation of industrial zones, (ii) *Metropolitan* and *megapolitan* regions[117], have economic importance far beyond their demographic share, and this dominance is increasing. Accordingly, any initiatives that improve the efficiency of metropolitan areas as environments for production, transactions, innovation and day-to-day life will have highly leveraged socio-economic and environmental impacts in China. For example, by 2020, the three largest megapolitan regions, the Pearl River Delta (PRD), the Lower Yangtze Delta (LYD), and the Beijing – Tianjin Region (BTR) will account for 65% of China's economic output, but only 18% of the population.

International Experience

The experience of eight selected metropolitan regions in developed countries is reviewed. These metropolitan regions were selected because they represented varying approaches to metropolitan governance. United States (US) metropolitan areas have had to learn how to function while local jurisdictions retained close to full autonomy. The result has been the rise of Special Districts, which undertake one or more specific functions, e.g., sewerage, at the metropolitan scale. There are now over 36,000 Special Districts in the United States, compared with 15,000 in 1977. Also of interest in the US is the important role that civic organizations play in metropolitan governance. For example, the Regional Planning Association, a voluntary organization strongly supported by urban professionals, has significantly shaped the tri-state New York Metropolitan Region's future since 1922, largely by working closely with local agencies (particularly the Port Authority of New York and New Jersey), in the context of state and federal government frameworks, e.g., matching grants to transportation systems. In Europe, metropolitan governance is often more unified and top down, and is especially known for achievements in

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[117] For purposes of this paper a *metropolitan* region contains at least 1.5 million people within its immediate economic hinterland. A *megapolitan* area contains at least two metropolitan regions linked by substantial physical (often corridors) and economic flows, and a total regional population in excess of 10 million people.

utilizing transportation investment, closely aligned with land use planning to realize compact, energy saving, pedestrian friendly urbanization. The polycentric Randstad Region and London are prime examples of effective and innovative metropolitan governance in Europe. In East Asia, metropolitan governments have had to cope with rapid growth over the last several decades creating volatility, and the need for focus on fiscal management and infrastructure investment. For example, the Tokyo Metropolitan Government, the largest metropolitan government in the world (in terms of population), covering virtually all of the built up Tokyo region, is known for its efficient service delivery and land use planning, using innovative tools such as land readjustment. However, it is currently coping with the dramatic fiscal and social service impacts of a stagnant or declining population, associated with rapid aging of the population, a future that has caught the system somewhat off-guard.

Several lessons are clear from the international experience, applicable both to China, and more generally to middle and developed metropolitan regions worldwide:

(i) Metropolitan areas should be geographically large enough to encompass new development. The usual case is for the metropolitan governments to under-bound the built up urban area, e.g., Seoul, Toronto, and Bangkok. A game of spatial catch-up ensues, usually unsuccessfully because local governments in metropolitan areas do not like to be put out of business through amalgamation.

(ii) Because metropolitan areas are almost more sensitive to the global economy than smaller settlements and pioneer socio-economic change, they can be unexpectedly hit with shocks that require rapid response, e.g., Seoul and Bangkok after the 1997 financial crisis. Effective metropolitan governance means carefully anticipating external shocks and change, not just "minding the shop".

(iii) Infrastructure is the prime shaper of metropolitan spatial structure, and should be used to shape cities. However, mechanisms to finance large-scale trunk infrastructure that would lead, rather than follow metropolitan physical growth are often not adequate.

(iv) Vertical functional mandates within metropolitan areas, e.g., between districts, counties and the municipality, are often unclear, and/or do not correspond to the spatial scales at which different services are best delivered. Similarly, incentives and institutional structures to induce horizontal co-operation among local governments, e.g., districts sharing a landfill, are often not in place.

(v) Significant fiscal disparities among local governments in metropolitan regions is common, often the product of fiscal systems that favor jurisdictions undertaking certain economic functions, e.g., manufacturing. Mechanisms to transfer fiscal resources to sub-metropolitan jurisdictions with special functions or needs may be needed, e.g., to perform environmental services, or to address the training needs of a concentrated disadvantaged population.

(vi) The role of civil society is important in metropolitan governance in many parts of the world. For example, the current *Chicago Metropolis 2020* initiative represents a continuation of long-standing key involvement of the Commercial Club of Chicago in metropolitan governance. In

Phoenix, US, business groups partner with local government in facilitating economic development processes at the metropolitan scale (the Greater Phoenix Economic Council).

Chinese Metropolitan Governance: Key Issues

There are over 150 Chinese metropolitan regions, overwhelmingly concentrated in the eastern half of the nation, largely corresponding to the overall distribution of China's population. *Municipalities*, composed of *Urban Districts* (which collectively form the *City Proper*) and *Counties*, over bound actual built-up urbanization with a few exceptions such as Shenzhen and Guangzhou. Within the Municipality, Urban Districts, and Counties, a set of Bureaus exists, e.g., Construction, Environment, Public Security. Despite the overall appropriateness of the foregoing structure for effective metropolitan governance, Chinese metropolitan regions face pressing issues. This is not surprising given their rapid demographic and economic growth over the last two decades, which coincided with a dramatic transition to free market urban economies, including establishment of vibrant land and housing markets (Technically land is leased for 70 years for residential purposes, tantamount to ownership). Key issues include:

(i) *Lack of a Unified Metropolitan Administrative Authority.* Particularly in the affluent coastal areas, Urban Districts and Counties, with strong revenue bases, and close ties to local firms, operate increasingly independently from Municipal Governments. Although formal Municipal powers are the same nationwide, in the Interior, and particularly the West, Municipal Governments are able, or willing, to exert greater authority. This may be a case of greater capacity and private wealth at the County level in coastal metropolitan areas, enabling Municipalities to be less active, rather than a case of Municipal Governments being more "metropolitan oriented" in the Interior and West. In particular, Counties act independently within Metropolitan areas and are often reluctant, with exceptions, to be up-graded to the status of Urban District, which would cause them to lose autonomy, particularly in fiscal/budgetary matters.

(ii) *Unclear allocation of functions and a mismatch between function and fiscal resources.* Since the Chinese Constitution does not mandate the roles of different levels of Government, nor are there national administrative guidelines per se, urban functions are often duplicated at different levels, or undertaken at inappropriate levels. For example, major arterial roads may be inappropriately routed and built by Counties.

(iii) *Chasing Manufacturing and Property Development.* The fiscal system encourages local governments (Districts, Counties) to chase manufacturing to receive shared corporate and excise taxes, a portion of which is returned to sub-national governments. This encourages a proliferation of industrial zones, contributing to inefficient metropolitan spatial structure. Given the competition for manufacturing, less desirable areas attract a concentration of low end, e.g., polluting, industry. At the Municipal level, the reliance on land lease sales as the prime source of revenue (literally billions of US dollars over the last 20 years in most metropolitan areas) encourages over-release of land (leading to lower prices) contributing to lower densities, sprawl, etc.

(iv) *Fiscal – Budget Complexity*. Official fiscal systems / budgets often represent half or less of public funds being processed by Municipal and County Governments. Although these official

budgets are often quite transparent (many urban jurisdictions publish them in the local newspaper), off-budget activity is often obscure. This situation, two sets of budgets and lack of transparency in off-budget activities, makes rational programming-budgeting, including capital budgeting, more difficult at the Metropolitan scale. For example, large numbers of concession-type agreements, e.g., toll roads, are often awarded on an ill-advised ad hoc basis, making regional travel expensive, and inefficient, due to incrementally designed networks.

(v) *Low Quality Peripheral Development.* Worldwide, most cities expand primarily on their built up margins, thus the quality of peripheral development is very important. In China, such expansion usually occurs in Counties. Counties have very poor environmental performance, often not monitoring their environments closely (despite a requirement to do so), with local officials rewarded for short-term economic performance, especially in regard to manufacturing. (This situation is starting to change.) Environmental emissions in metropolitan areas, from Counties, may impact the whole metropolitan area through downstream and downwind effects. Furthermore, Counties, with the exception of high level Economic and Technical Development Zones (which are controlled by the Municipality – split off from Counties), tend to convert rural land to urban uses on a small site, piecemeal basis, creating peri-urban landscapes that may be difficult to retrofit later, when their poor quality and low densities is no longer acceptable.

(vi) *Inappropriate Physical Planning Systems.* The physical planning system utilized in virtually all Chinese Municipalities tends to rely on master planning, rather than leading edge strategic planning, performance based area planning, etc. This static approach to planning is poorly suited to rapidly growing Chinese metropolitan regions. Urban plans are often unrealistic, i.e., do not reflect market forces, public investment by important government agencies, e.g., airports, Hi-Tech parks. Physical plans are frequently unimaginative, prepared using mechanistic standards by Urban Design Bureaus, given the lack of significant private urban planning capacity. The result is that the plans are not respected, and therefore do not guide the actions of other government bureaus and the private sector. The land quota system is breaking down through "gaming" of the system, e.g., a jurisdiction will remove less desirable land (e.g., remote, rough terrain) from urban status, enabling it to effectively increase its land quota. This situation would be of less concern if the primary land market and the land use planning systems were performing more effectively.

(vii) *Inefficient Urban Form.* Of increasing concern, especially with the rising cost of energy, is the spatial structure of Chinese metropolitan regions. Leap-frog physical development is the norm with very lengthy peripheries hiding large amounts of undeveloped land within edges. Processes contributing to leap-frog development include historical factors (satellite industrial towns), aggressive investment in urban infrastructure by outlying Counties causing development to bypass Counties closer to the center, the impact of excessively high Ministry of Construction standards (e.g., too wide roads) on peri-urban development, and under-priced land release, especially for manufacturing, in the primary market (i.e., land sold directly by governments). But there is a positive side to this condition - much land is available for in-filling in Chinese metropolitan areas, and is increasingly occurring in metropolitan regions such as Guangzhou and Chengdu.

Chinese Metropolitan Governance: Policy Responses

In response to the foregoing issues, the following possible policy initiatives are suggested for consideration:

(i) *Strengthen Municipal Authority.* Municipalities should use their powers more extensively to effect metropolitan – wide planning, and construct and/or manage infrastructure and services most efficiently delivered at a metropolitan wide scale. In instances where this proves impossible, e.g., delivery of certain functions in affluent coastal regions, mechanisms should be put in place that encourage horizontal co-ordination among local governments in the Metropolitan Region. (Many proven mechanisms exist to do this, e.g., Councils of Local Governments, Special Districts, Bilateral and Multi-lateral Contractual Agreements, often encouraged through matching grants from senior governments.) Counties should be upgraded to Urban Districts much earlier in the urbanization process. In all cases, Municipal metropolitan leadership should be informed, through systematic bottom-up processes by the perspectives (voice) of sub-Municipal governments and their stakeholders, even if these lower level governments are not responsible for the delivery of the function in question.

(ii) *Create more Provincial Level Cities.* Given the clear Constitutional status of Provincial Level Cities (four exist: Beijing, Shanghai, Tianjin, Chongqing) and their clearer mandate (compared with Municipal Governments) to guide metropolitan development and to act rapidly in concert with the national government, many more Chinese metropolitan regions should be up-graded to this status as soon as possible. Simultaneously, the new (and existing) Provincial Level Cities should be mandated to pursue metropolitan-wide governance, as indicated above (i).

(iii) *Overall reform of urban fiscal systems is needed.* As a general principle, key revenue sources available to local urban governments should not be highly biased toward certain economic functions. A property tax system should be considered, given that primary land lease sales, which are currently the main source of revenue for Municipal governments, are a one-off phenomenon. There would be many benefits from introduction of a property tax system, e.g., less incentive for private owners to hold idle land, and for local governments to chase manufacturing relative to other land uses, plus there would be less fiscal sensitivity to economic cycles. Reform of metropolitan fiscal systems would result in Municipalities having ample revenue to transfer funds to sub-metropolitan jurisdictions performing valued metropolitan wide services. For example, a County acting as the lungs of a city by providing widespread green space could be rewarded through fiscal transfers. (This situation is emerging in Chongming County in Shanghai. In Chongming, the Shanghai Government has begun construction of an "eco-city" named Dongtan, designed to be a showpiece sustainable city of 20,000 residents by the time of the 2010 Shanghai Expo.)

(iv) *Finance for Pro-Active Infrastructure Development.* Given the importance of pro-active infrastructure development in shaping cities (corridors, suburban centers), improving energy efficiency, etc., effective means to finance high cost/value infrastructure systems in metropolitan areas are needed. Although systems are in place, e.g., the increasing role of the Chinese Development Bank in urban lending, the national bond system to finance infrastructure development in the West, lending by multilaterals such as the World Bank, much more needs to

be done, e.g., issuance of bonds by the largest cities such as Shanghai, and development of on-lending systems catering to smaller credit-worthy metropolitan regions.

(v) *Increased involvement of civic organizations in Chinese metropolitan management.*
International experience indicates significant benefits from civic society involvement in metropolitan planning and management. Most realistically, this could start with growing involvement of local branches of professional organizations (e.g., the Chinese Association of City Planners, Chinese Association of Architects, Chinese Association of Land Economics / Surveyors) and business associations, e.g., local industrial, trade and cluster associations. (The latter is emerging, e.g., the role of the Shoe Cluster Association in Chengdu's governance, the role of industrial groups in metropolitan coastal areas such as Xiamen.) Other types of civic organizations, e.g., environmental, could follow.

(vi) *National Recognition of Megapolitan Planning.* China contains three megapolitan regions (Lower Yangtze Delta, Pearl River Delta, Beijing – Tianjin Region) while at least five others are emerging, e.g., the Chongqing – Chengdu Corridor, the Ha-Da-Qi (Harbin – Daqing – Qiqihar) Corridor. A regional structure plan has already been prepared for the Beijing – Tianjin Region, while a sixteen Municipality development co-ordination system is active in the LYD. Ongoing activities of the latter include regular meetings of the mayors of the sixteen Municipalities and regular meetings on economic cooperation organized by the policy advisory bodies of each Municipality. The national government should put forward guidelines to encourage and make official megapolitan scale coordination, i.e., cross-Province and cross-Municipal strategic planning and development coordination in megapolitan regions.

(vii) *Development of Metropolitan and Megapolitan Data Sets.* The US officially defines *micropolitan* and *metropolitan* areas, and may shortly officially recognize *megapolitan* regions. (These data sets are separate from the US urban – rural data set, which is similar to China's.) China should consider officially defining such regions, which correspond better to contemporary real urbanization patterns, releasing data sets from the Census, etc. on such spatial bases, in order to facilitate understanding of megapolitan scale development. This would significantly support megapolitan scale strategic planning, as advocated above (vi).

Chapter 1 International Metropolitan Governance: Lessons Learned

1.1 Introduction

This Chapter reviews current innovative practice in metropolitan governance in developed countries. These metropolitan regions were selected because they represented varying approaches to metropolitan governance. Metropolitan governance in these nations is relevant to China because leading Chinese metropolitan systems will soon achieve developed status, considerably ahead of the Chinese national economy as a whole. The case studies examined, and the prism through which the analysis was undertaken, are based on priority Chinese issues and policy objectives (see Chapter 2). Accordingly, selected substantive themes are pursued, especially the role of civil society in metropolitan governance, fiscal sustainability and equity, intra-metropolitan urban form, and the role of metropolitan governance in economic development.

Most content in this Chapter is presented in the form of Boxes, outlining what is most striking in terms of metropolitan governance in the eight case study metropolitan systems assessed.

Governance – not Government

This Paper purposely addresses the issue of *Metropolitan Governance*, not just metropolitan government. We are only interested in agencies (whether government or non-government) that affect the whole metropolitan region, particularly in terms of cross-jurisdictional (horizontal) co-ordination. In other words, we are not interested in the myriad of government initiatives undertaken *within specific jurisdictions* in a metropolitan region, but rather focus on those institutions that attempt to improve metropolitan wide performance.

Governance includes (i) formal government institutions, (ii) private, often corporate, bodies, and (iii) the space between them, namely civil society. Our stance is driven by two factors: (i) China is currently characterized by a relatively thin civil society, but the Government has indicated a desire to thicken this dimension of metropolitan governance, and (ii) there is a track record of successful civil society involvement in metropolitan governance in developed countries, the most obvious case being the long, and influential involvement of the Regional Planning Association in development of the thirty-one county New York – New Jersey – Connecticut *Megapolitan Region*[118] (since 1922, producing the first regional plan in 1929). This model of civil society involvement in metropolitan planning has been replicated in many metropolitan areas throughout North America.

International Variation

Civic organizations are most important as agents of metropolitan governance in the United States. Fiscal considerations are at the forefront in many East Asian cities, e.g., Tokyo, but also in some United States (US) ones, e.g., Minneapolis-St. Paul (Twin Cities). Canadian metropolitan governance structures tend to stress effective delivery of services and incorporation of disadvantaged groups into the urban opportunity structure. Continental Europe is known for achievements in utilizing transportation investment, closely aligned with land use planning to realize compact, energy saving, pedestrian friendly urbanization. A further characteristic of European metropolitan is the significant role that national governments play in guiding

[118] *Megapolitan* is defined in Chapter 2.

metropolitan urbanization in many cases, e.g., the Randstad, as well as the role of the supra-national European Union (EU) in facilitating the integration of metropolitan systems into megapolitan systems facilitated by European-wide economic and transportation/logistics systems, e.g., the expanding high speed rail system (HSR). Economic development is a key priority of metropolitan governance in many US systems (Chicago, Phoenix), and British ones (London, Glasgow).

Structure of Metropolitan Governance
In addition to pursuing selected substantive topics, identified above, we assess the structure of metropolitan government, which varies widely, e.g., (i) *unicities* (Tokyo Metropolitan Government, Calgary, Winnipeg), (ii) *unicity core and limited co-ordination of analysis and planning (by a senior government) for the wider extended urban region* (Bangkok Metropolitan Region, Greater Toronto Area, Seoul Metropolitan Area), (iii) Special (or *Regional) Districts* which deliver one or more services metropolitan wide, while retaining autonomous jurisdictions such as cities (Greater Vancouver Regional District, East Bay, California, and Minneapolis – St Paul), (iv) *Strong metropolitan government but continued existence of a lower tier of Cities*, *Districts*, or *Boroughs* (London, Seoul Metropolitan Government), and (v) Civil society led metropolitan co-ordination of highly autonomous sets of local governments (New York, Chicago), the latter often combined with regional district delivery of specific services, and (vi) national government led co-ordination of extended urban region or polycentric region governance (the Randstad). The foregoing classification should not be viewed as mutually exclusive or exhaustive. Examination of world-wide practice reveals that metropolitan jurisdictions mix and match the above structures/systems.

In assessing metropolitan governance, it is important to take a dynamic perspective as structures and processes frequently change. For example, the current city of Toronto (a *unicity*) was once composed of 13 separate jurisdictions, the Bangkok Metropolitan Administration was once separate cities (Bangkok and Nonthaburi) on either side of the Chao Praya river. But the trend is not always toward amalgamation, in Los Angeles, areas attempt (sometimes successfully) to secede to create small, but more homogenous socio-economic units, with significant intra-metropolitan fiscal implications. (Affluent communities do not want to share their largesse with the larger urban system, especially in terms of primary and secondary education.) Demographics of a metropolitan region is an important variable. Fast growing cities, such as Toronto and Phoenix and Shenzhen usually outpace the boundaries of metropolitan governance mechanisms., even . For example, what was formerly known as Metropolitan Toronto is completely built out, Chinese Counties are often upgraded to Urban Districts (and thereby more fully integrated into Municipal scale metropolitan planning and management) too late, long after they are dominantly urban in character.

1.2 The North American Experience
The common perception of United States metropolitan regions is that of weak metropolitan government. Metropolitan regions, such as Chicago, may have hundreds of local jurisdictions (385 in the case of Chicago), and, in some urban regions, such as Los Angeles, the number is actually increasing as existing jurisdictions split. Although this picture is not inaccurate, it hides learning of considerable relevance. This is because US metropolitan areas have had to learn how to function successfully as metropolitan entities, while local jurisdictions retained essentially full

autonomy. The result of considerable adaptation is pragmatic systems that often work surprisingly well. What is most surprising is the wide variation in metropolitan governance systems in Canada and the United States – in response to differing local cultures, political realities, the age and socio-economic/demographic trajectory of the metropolitan region, etc.

An important lesson from the US metropolitan experience is the key role that civic organizations play. In Silicon Valley (a sub-metropolitan area – the world's leading innovation area), New York, Chicago, Phoenix (four of the ten largest Standard Metropolitan Statistical Areas [SMSAs] in the US), civil society organizations literally drive metropolitan governance. This is not a new tradition, the Regional Planning Association (RPA), has been instrumental in shaping the tri-state New York- New Jersey – Connecticut region since 1922. In the United States, civic group metropolitan leadership is predominantly from the business community, as in Chicago or Phoenix (the Greater Phoenix Economic Council),[119] or from the urban design / city building community, particularly professional groups, as in New York. (See Box 2 for an assessment of the Chicago case, and Box 2 for an assessment of the New York case.) In the United States, groups associated with business and city building professions have enjoyed considerable credibility (often more than local politicians), enabling them to exert considerable influence.

Box 1

New York Metropolitan Region: ***A Legitimized Civil Society Approach to Megapolitan Planning: The Pioneering Role of the Regional Planning Association***

The New York metropolitan region (NYMR) is the most populated urbanized area in the U.S. (2005 U.S. Census Bureau CSA pop. 21.9 million), and based on the UN urban agglomeration classification, the third largest in the world (after Tokyo and Mexico City). It covers 31 counties of the tri-state New York-New Jersey-Connecticut region encompassing 33,670 sq km. New York City, the core of the metropolitan region has a population of over 8.1 million with an area of 830 sq km, only 2.5% of the land area of the metropolis. A *global city*, New York is known for international finance, fashion, entertainment and culture. New York City itself has been a metropolitan municipality with a strong mayor-council government since its creation, the product of a consolidation of a number of autonomous local governments in 1898. The mayor is elected to a four-year term while 51 councilors are elected to two-year terms, strengthening the power of the mayor.

There is no "official" regional planning organization for the NYMR, but the Regional Plan Association (RPA), as an independent, not-for-profit regional planning organization is highly influential in planning both the region and its component jurisdictions. It is the de facto Regional Planning agency for the NYMR, having more power and a more impressive track record than virtually any metropolitan planning organization in the United States. This civil society based approach to planning in the NYMR is not regarded as a stepping stone to legal formalization, but a more advanced approach to regional planning based on collaborative planning, currently in vogue in both governmental and academic circles. Collaborative planning involves bringing representatives of key interests to the table, governments being only of the parties involved, although they are expected to legalize most outcomes of the process (some initiatives can be implemented purely through non-governmental means). The RPA's de facto legitimacy and stellar reputation is the product of two factors, its long history, and the high quality of its work. It was established in 1922.

RPA has played a key role in shaping the Region's transportation systems, protecting open spaces, and promoting high quality urban development. The First Regional Plan completed in 1929 set the form for the

[119] The GPEC is complemented by the more interest group oriented Valley Citizens' Forum which attempts to co-ordinate development in the eastern (more affluent) half of the Greater Phoenix region.

Region's growth over the next several decades, correctly identifying transportation and open space networks as the key levers to shape the Region. The Second Regional Plan in 1968 successfully targeted: (i) restoration of the Region's deteriorated mass transit system, and (ii) revitalization and strengthening of urban centers to make mass transportation more viable, preserve natural resources, and create areas of high urban intensity within the vast Region. The Third Plan, in 1996, *A Region at Risk*, addressed the Region's extreme fiscal problems. In the post 9/11 period, RPA has been involved in the redevelopment of lower Manhattan, seriously damaged by the terrorist attacks, as well as strengthening disadvantaged communities such as East Harlem, through community based activities.

As well as being a world-class regional research and planning organization, RPA has considerable strengths as an advocacy organization, an educational and awareness agency (working with local governments, communities, and the public), the latter strengthened by partnerships such as with the Institute on Community Design at Princeton University. One of the greatest strengths of the RPA is its links with leading US professional groups such as the American Institute of Architects (AIA), the American Institute of Planners (AIP), and the American Society for Public Administration (ASPA). Strong professional connections enable the RPA to access some of the best talent in city building, at affordable rates, or even on a voluntary basis.

RPA always takes an interdisciplinary perspective that integrates economic development (competitiveness), human resources and the human condition, land use, transportation, and environmental and design expertise. To implement, RPA's main strategy is to build an alliance of various stakeholders, including local governments, interest groups (e.g., environmental), professional groups, and the business community. Given the enormous power of the Port Authority of New York and New Jersey, RPA has long worked closely with them, using the Authority as a lever to shape the Region.

Key References:

Alfsen-Norodom, Christine (2004), *Managing the Megacity for Global Sustainability: The New York Metropolitan Region as an Urban Biosphere Reserve*, Annals of the New York Academy of Science, vol. 1023, pp. 125-141.

Civic Alliance (2006), *About Civic Alliance*, Regional Planning Association, available online at www.civic-alliance.org

Regional Planning Association (2006), *About RPA*, available online at www.rpa.org

Box 2

Chicago: *Institutionalization of a Civic Metropolitan Initiative*

Chicago grew from under 30,000 people in 1850 to 1.1 million in 1890. The world had never seen such fast urban growth. As such, the city is of considerable relevance to fast-growing Chinese metropolitan areas today.

The Chicago metropolitan area, with a population of 9.4 million covers 6 counties. These six counties, in turn, include 113 townships, 272 municipalities, 303 school districts, and 587 special purpose governments. The Metropolitan Mayors Caucus, formed in 1997, which includes the 272 mayors, all of equal standing, has difficulty resolving contentious issues. Yet Chicago works, and is able to undertake strategic initiatives, such as enlarging O'Hare airport, one of the most important in the world. How does it do this?

Chicago has always has been governed by the business community. By the end of the nineteenth century, Chicago's business leaders had made considerable money out of America's western expansion, had seen new city planning ideas in Europe, e.g., the 1899 Paris World's Fair, and wanted to make Chicago into the "Metropolis of the Middle West". Accordingly, in 1909, the Commercial Club, a membership organization of leading metropolitan area business and civic leaders started in 1877, commissioned one of its members, Daniel Burnham, to draw up a plan for Chicago; he created a plan that drew much inspiration from Paris, and to this day, shapes Chicago's metropolitan structure.

This same Commercial Club of Chicago marked Chicago's millennium in 1996 by forming six committees to rethink the metropolitan region's future. Based on their work, a new organization: "Chicago Metropolis 2020" was created in 2000 after the release of, *Chicago Metropolis 2020: Preparing Metropolitan Chicago for the 21st Century*. By 2006, the Metropolis Project's efforts resulted in the establishment, by the Illinois State General Assembly, of the Regional Planning Board with broad, bipartisan support. This Board is now responsible for coordinating regional land use and transportation planning in northeastern Illinois. The Board will report back to the Governor and the Illinois General Assembly by September 2006 with specific legislation to accomplish the tasks outlined in its establishing legislation, motivated by the work of *Chicago Metropolis 2020*.

Chicago Metropolis 2020 includes representatives of business, labor, civic and government organizations. The committees regularly consult with experts and meet with regional community, civic and government representatives. Issues of major concern to the committees include low-density sprawl, concentration of poor minorities, the spatial mismatch between jobs, affordable housing and transportation, and disparate degrees of access to quality education.

With an advocacy role and civic leadership, Chicago Metropolis 2020 has championed a number of regional initiatives and their implementation. For example, the Chicago region will benefit from integrated transportation planning as a result of an updating of the Chicago Regional Planning Act in August 2005. A Regional Learning program pioneers metropolitan education; it is an ongoing public outreach campaign focusing on issues that transcend local political boundaries. Its flagship output is the Metropolis Index, an assessment of key issues facing the Region including: housing, education, innovation and entrepreneurship, land use, safe neighborhoods, and economic competitiveness.

The Chicago Metropolis 2020 initiative is a prime example of a metropolitan wide civil society governance organization undertaking metropolitan governance. To a very significant extent, the State and local Governments accept and legalize the results of this strategically oriented metropolitan planning process. More than in the case of the New York Metropolitan Region, where civic-based metropolitan governance is based more on the professional community, in Chicago, always known as a business city, metropolitan governance is based on the initiatives of the business community, as has been the case for over 100 years. However, over the last several decades, other community stakeholders have been incorporated into the process, making it more representative. It is not surprising that Chicago advertises itself as "the city that works".

Key References:

Chicago Metropolis 2020, *About us*, available online at www.chicagometropolis2020.org
Chicago Metropolis 2020, available online at www.cm2020.org
Grimond, J, "A Survey of Chicago", *The Economist*, March 18 2006 (Special Survey, pp 3-18)
See www.economist.com/surveys

United States metropolitan management is well known for *Special Districts* (or *Regional Districts*). Special Districts are not local governments (although they may evolve into metropolitan governments). Rather, they are products of adaptation, set up to a deliver a service, or services, best undertaken at a larger spatial scale than the typical local government. Essentially they are the product of an inability to amalgamate local government units in the US (i.e., move toward the unicity model),[120] or create powerful metropolitan governments, as in Tokyo or London. Often, their first function is related to a basic need, e.g., sewerage (as in the case of the East Bay Municipal Utility District [EBMUD] in the San Francisco Region), then, other services are added. Special Districts generally have a positive track record in the US, significantly accounting for the satisfactory, or better, performance of many US metropolitan systems. Special Districts are the only type of governance unit in the US that has grown rapidly since 1977. There

[120] For more detail, see: Phares, D., *Metropolitan Governance Without Metropolitan Government*, Hants: Ashgate, p 18

are now 35,356 Special Districts in the US. (2002 US Census of Government) compared with 15,174 in 1977.[121] Most of these Special Districts are in metropolitan areas. Often associated with metropolitan regions characterized by widespread use of Special districts, although not always, are Federations of Local Governments (FLGs), sometimes termed Councils of Local Government (CLG). FLGs are voluntary organizations of local governments in metropolitan areas designed to encourage co-operation in co-ordination of metropolitan government. FLGs are not limited to the United States, they are found in many other jurisdictions, e.g., Australia. Because these bodies are voluntary, they do not require local governments to cede power, unacceptable to most local governments.

The Greater Vancouver Regional District (GVRD) in neighboring Canada is universally regarded as an example of one of the world's best performing metropolitan governance systems. (See Box 3.) In the GVRD case, new functions and local governments have been added over the years, and innovative measures have been introduced, e.g., establishment of bi-lateral arrangements with adjacent, still primarily rural, peri-urban jurisdictions, and advancing thematic cross-functional agendas, such as the Livable Region Strategic Plan initiative, introduced in 1996.

Box 3

Greater Vancouver Regional District: ***An Evolutionary Approach to Regional District Based Metropolitan Planning & Management***

The Greater Vancouver Regional Districts (GVRD) was established in 1965; it now encompasses 21 municipalities that make up the metropolitan area of Greater Vancouver, an area that is home to 2.1 million people (2005), forecast to reach 2.7 million by 2021. The GVRD was originally constituted to deliver services most efficiently accomplished at a regional level, namely sewerage, drinking water, health/hospitals, and industrial development services. It has added functions over the years, including recycling, affordable housing, regional parks, air quality control, labor relations, and emergency communications (911). GVRD's mandate is to cost-effectively deliver utilities services at the regional scale, to plan and manage regional growth and development, and to protect and enhance the quality of life in the Region. The GVRD's Board of Directors is the primary decision-making body and collective voice in regard to regional development issues. The Board of Directors is comprised of mayors and councilors from the member municipalities. Board meetings are held once a month and are usually open to the public. The GVRD stresses the involvement and participation of interested members of the general public.

Under the umbrella of the GVRD, there are four separate legal entities: the GVRD/University of British Columbia (UBC) Joint Committee, the Greater Vancouver Water District (GVWD), the Greater Vancouver Sewerage and Drainage District (GVS&DD), and the Greater Vancouver Housing Corporation (GVHC). In addition, the Greater Vancouver Transportation Authority (Trans Link) was formed in 1998 as a body associated with the GVRD to coordinate and implement transportation plans and services for the movement of people and goods in the Region. Trans Link also operates the Air Care program, which aims to improve air quality by reducing harmful emissions from automobiles. From 1992 to 2002, the program is credited with reducing air emissions in the urban area by thirty-five percent.

[121] On the other hand, the number of Counties has stayed stable (3,034 in 2002 versus 3,042 in 1977), as has the number of Municipalities (19,431 in 2002 versus 18,862 in 1977) and Townships (16,506 in 2002 versus 16,822 in 1977), while the number of school districts has been cut substantially through consolidation (13,522 in 2002 versus 15,174 in 1977).

Vancouver has received numerous international awards, and ranks amongst the most livable cities in the world, according to premier media, such as, *The Economist*. Maintaining this quality of life is a significant challenge particularly in the face of population pressures, changing demographics, and economic re-structuring, plus demands for housing and employment associated with rapid growth.

In 1990, the GVRD Board produced, *Creating our Future: Steps to a More Livable Region* to respond to challenges facing the Region. It engaged more than 4,000 residents in a public consultation process. The over 200 issues identified in the process resulted in agreement to take 54 actions, incorporated in the, *Livable Region Strategic Plan*, introduced in 1996. Importantly, like most metropolitan agencies worldwide, the Regional strategy advocates development of *Regional Towns* to minimize urban sprawl, commuting, and air pollution. Other agencies, the private sector, and residents use the plan to understand and contribute to Greater Vancouver's vision for its future development. It helps all stakeholders "to face in the same direction".

To improve metropolitan governance, the GVRD set up the Sustainable Region Initiative Forum. Regular discussion and meetings such as sustainability community breakfasts and regional dialogues are organized. In addition, the Greater Vancouver Economic Council (GVEC) has been established as the catalyst to deepen high promise industrial clusters and thereby enhance the regional economy. An important mandate of the GVEC is to take the lead in attracting investment to the Region through marketing and branding. GVEC's mission is to support development, positioning the Region as the West's Gateway to Asia and Canada's "Creative City".

Much can be learned from the GVRD case. Of note is its evolutionary character. Although originally created to deliver "routine" functions such as sewerage, it has steadily added functions over the years as confidence in its role has increased. It does this in two ways: (i) internally, e.g., through agencies such as the GVHC, which operates within the GVRD's institutional framework, and (ii) by spinning off entities such as the GVEC. Although it increasingly appears to be a regional government, it denies this role, being careful to allow constituent municipalities to maintain their autonomy. Important in this regard is the fact that municipalities can choose to opt out of any function or service provided by the GVRD. Much of GVRD's success can be explained by its ability to mediate tensions between the British Columbia Provincial Government (Provincial governments are very powerful in Canada) and constituent municipal governments.

Key references:

Greater Vancouver Regional District (2006), *About GVRD,* available online at http://www.gvrd.bc.ca
Western Economic Diversification Canada (2006), *Vancouver Working Group Discussion Paper: The Livable City*, Government of Canada, Ottawa

Other lessons can be learned from the North American experience. One is that making national funding to governments, agencies, and regional districts in metropolitan areas conditional on planning, air pollution reduction, etc., can carry weight. The best example is the Atlanta Metropolitan Region (which anchors the Piedmont Megapolitan Region), strung out along the I-94 expressway, the most sprawling metropolitan region in the world. The US federal government cut off transportation matching funding to the Atlanta metropolitan area until it developed a regional plan to better shape the region's development – compliance resulted.

A noticeable trend in North America has been that new metropolitan areas have many fewer local jurisdictions than do older metropolitan regions (e.g., Chicago) or middle aged ones (e.g., Los Angeles). This enables more coherent governance of the metropolitan region. For example, Greater Phoenix, the seventh largest metropolitan region in the US (over 4 million population) has 13 local governments compared to 385 in Chicago and 200 in Minneapolis – St. Paul; the Las Vegas metropolitan region, the fastest growing in the US, with a current population over two million has only five. This trend parallels a similar dynamic in China, discussed in Chapter 2, where "newer" western metropolitan regions (Municipalities) exert much greater control over

their metropolitan regions than do the coastal and eastern cities, e.g., Shanghai. We would like to think that this trajectory in the US is the result of a quest for better metropolitan governance based on applying past learning, but other factors are also at play. These include the very rapid growth of the "New West" metropolitan regions (e.g., Las Vegas, Phoenix, Tucson, Salt Lake City, Calgary, Edmonton) meaning that there was less time for community-based small jurisdictions to form, and, arguably, there is greater spatial socio-economic heterogeneity in the new west metropolitan regions.

In sum, in the United States, as noted by Phares, a relatively successful model has evolved, one that does not require local governments to amalgamate or cede large amounts of power, but benefits from economies of scale and network rationalization through use of Special Districts, and from the tendency of metropolitan areas to undertake strategic planning, and marketing / promotion at a metropolitan level, often led by strong civic organizations.

Phares refers to a third wave in the development of US metropolitan governance.[122] This third wave, really a refinement of the foregoing, is epitomized by: (i) Direct involvement of civil society in metropolitan governance. (ii) More emphasis on partnerships, both public-private, and among jurisdictions within a metropolitan area. (iii) Increased use of collaborative planning, i.e., real bargaining among representatives of interest groups to develop Visions, Strategies, etc., in which local governments are just one of the parties at the table, but who ultimately legalize outcomes from such collaborative processes.

Much has been written about Toronto's metropolitan governance, of late, some negative. (Box 4 describes the main characteristics of the Toronto's case.) As noted in the Box, local jurisdictions in what used to be called Metropolitan Toronto have been amalgamated into the new City of Toronto, with a population of about 2.3 million. However, this "reform" has failed to keep pace with the accelerating physical spread of Toronto, and the transformation of its physical structure toward a multi-nodal model (based on the rapid development of significant exurban centers such as Mississauga), and away from the monocentric structure for which Toronto was well known in the past.[123] Local governments in The Greater Toronto Area (GTA), with a population of 5.6 million people (most residents of the GTA live outside the City of Toronto) operate virtually autonomously from the City of Toronto. Although the Ontario Provincial Government, through its Ministry of Municipal Affairs and Housing undertakes statistical and economic analysis for the GTA, and the Greater Toronto Marketing Alliance, a civic group, driven by business, is becoming more effective in marketing the Region, there is no formal metropolitan government that encompasses the extended urban region as a whole, nor no civic organization with deep legitimacy and high profile. On the other hand, critics taking a bottom up perspective point out that the City of Toronto is too large to effectively interact with neighborhoods and citizen's groups, especially given the fact that Toronto is well known for its distinctive neighborhoods, as touted by Jane Jacobs, the prominent urban commentator, who lived much of her life in Bangkok.

Box 4

[122] Phares, p. 24

[123] In the 1960s, Toronto's CBD dominated in terms of employment creation, with over 60% of commuters to the CBD using public transit, mainly the subway (TTC). Now, the CBD no longer dominates the Greater Toronto employment system, and less than 30% of commuters to the downtown use public transit.

City of Toronto / Greater Toronto Area: *Struggling to Keep up with Spatial Expansion*

The Greater Toronto Area (GTA) is the largest metropolitan area in Canada with a population of 5.6 million (2005), 15.9% of Canada's population. The GTA's total area is over 7,000 sq km. and covers the City of Toronto, and the 4 regional municipalities of York, Halton, Peel and Durham (which, in turn, contain 25 municipalities). The GTA is one of the North America's fastest growing economic regions, a leading destination for international migrants. It is known for a positive business climate, the product of advanced transportation and communication systems, , skilled human resources, and relatively low costs of doing business and living. The term of GTA came into usage in the mid-1990s after it was used in a widely discussed report on municipal governance restructuring in the region, prepared by the Ontario Provincial Government. However, to date, no one institution, official or a civil society group, with legitimacy, such as the Regional Planning Association in the case of the New York Metropolitan Region, is responsible for strategic planning in the GTA.

The Provincial Ministry of Municipal Affairs and Housing does undertake analysis on a regional basis, and is encouraging more formalization of the GTA concept. By putting forward the concept of a Greater Toronto Region, the Government of Ontario has stimulated civil society to take action on a truly metropolitan scale. Important initiatives include formation of: (i) The Greater Toronto Marketing Alliance (GTMA), a partnership of GTA local governments, the governments of Ontario and Canada, and private firms, serves as a key point of contact for businesses exploring investment opportunities in the GTA. (ii) The Toronto Research Alliance (TRRA), a non-profit organization of the Region's businesses, research institutions, and government partners oriented to moving the GTA's economy up the value chain, especially through development of biotech/life sciences, information and communication technology, and advanced manufacturing and materials science. (iii) The Toronto City Summit Alliance (TCSA), established in 2002, is a coalition of civic leaders from the private, labor, voluntary and public sectors in the Toronto region, as well as a network of hundreds of volunteer. The TCSA is oriented to social issues in the GTA, such as poor economic integration of immigrants and affordable housing, although it also addresses other issues such as expanding knowledge-based industry and decaying infrastructure.

In 1953, the Municipality of Metropolitan Toronto was created to administer common services for the City of the Toronto, the townships of East York, Etobicoke, North York, Scarborough and York as well as seven villages and towns. At that time it encompassed virtually the whole built up metropolitan area. In January 1998, the metropolitan government was abolished and constituent units were amalgamated to form the new City of Toronto. It reduced the former two-tier system to a single tier, a seemingly positive development. However, by that time, the area covered by the new unicity encompassed only 40% of the population of the GTA. Although the amalgamation of the municipalities to form the City of Toronto has resulted in saving of $150 million (Cdn.), it is not popular with residents, who voted down the proposal in a referendum, but had the structure imposed on them by the Provincial Government anyway. Opponents argue that the new city, with a population of approximately 2.3 million, is too large to be close to the people.

Within the GTA, the economic and social disparity among municipalities is a challenge. The City of Toronto argues that the surrounding municipalities, known as the "905" belt, based on the telephone code serving the area, have "stolen" investment, but have few cultural institutions, and are bedroom communities disproportionately dependent on the City for jobs.

In sum, the Greater Toronto Region is an example of a failure to develop effective metropolitan wide governance. Residents of the City of Toronto, the core, complain of inaccessibility to government, while the dynamic outer region, which contains most of the Region's population is not benefiting from being part of a cohesive extended urban region; its Municipalities and Regions continue to act in isolation from the core city. The growth of civil society organizations at the Greater Toronto Area scale is positive, but it is unclear whether they can coalesce into an effective region-wide organization, with the legitimacy and effectiveness of the New York Metropolitan Region's Regional Plan Association.

Key references:

Reddy, P.S. (2002), "The Greater Toronto Area Revisited: From Metropolitan Government to Unicity", *International Journal of Public Sector Management,* vol.15, no.1, pp.69-86

Wikipedia, *Greater Toronto Area*, available online at http://en.wikipedia.org
Greater Toronto Marketing Alliance (GTMA) (2006), *About the GTMA*, available online at www.greatertoronto.org
Toronto Region Research Alliance (TRRA) (2006), *About the TRRA*, available online at www.trra.ca/
The Toronto City Summit Alliance (TCSA) (2006), *About the TCSA*, available online at www.torontoalliance.ca

1.3 The European Experience

Given that cities in Europe are often located close together, along corridors, frequently trans-border systems, it is not surprising that urban region governance in Europe is often expressed at the megapolitan scale, and that national governments, and sometimes the supra-national European Union (EU) are involved in shaping these systems.

In continental Europe, metropolitan and megapolitan governance structures are often focused on physical issues, in particular creating razor sharp edges to urban build up, and protecting scarce green space. The Randstad, a horseshoe shaped urban belt with a green heart is an excellent example of European priorities, and accomplishments, in terms of megapolitan governance. (Box 5 provides details regarding the Randstad case.) The Netherland's national government has taken the lead in shaping the Randstad, through its Ministry of Spatial Planning and Environment. This Ministry has zoned the heart of the Randstad green as well as conserving green space between urban nodes along the Randstad urban belt (Utrecht, Amsterdam, den Hague, Rotterdam), and in sensitive areas, e.g., coastal beaches and wetlands. Realistic levers have been deployed to make the plan a reality, e.g., compensating land owners, primarily farmers, (through local government) in the green heart, to keep their land non-urbanized, and supporting development of strong urban cores, especially around railroad stations in the major nodes.

Box 5

The Randstad Region: ***National Government Led Megapolitan Development: Competitiveness and Environmental Enhancement in a Delta Environment***

The Netherland's urban system is not dominated by one city, but rather is a horseshoe shaped chain of cities and transportation facilities (Amsterdam, den Haag, Rotterdam, Utrecht, Schiphol airport, and Rotterdam seaport [the world's largest]), each playing specialized roles. The Randstad urban system is home to 7.2 million people (2005) or 46% of the Dutch population.

In 1990, the Netherlands Scientific Council for Government Policy recommended that the national Government establish a regional public organization, the *Regio Randstad Bureau (RRB)*, composed of the provinces[124] and the lead cities that constitute the Randstad to improve the quality of life and environment in the Region, as well as enhancing its competitiveness. The Region is located in a very geo-strategic location, it is where Northwest Europe meets the world's seas. Accordingly, the Region's cosmopolitan cities have played a major role in global trade and affairs over the centuries. However, none of the cities is large enough, acting alone, to effectively compete in Europe or on the global stage, hence the need to develop a more integrated, efficient urban system that benefits from the functional specialization of each of the Region's nodes.

The national government, through its Ministry of Spatial Planning and the Environment (MSPE), took the lead in establishing the RRB. In addition to important sub-national government involvement (described above), other national Ministries are involved as well, such as the Ministries of Public Housing, Economic Affairs, and

[124] The Randstad extends over the following Provinces: North Holland, South Holland, Utrecht and Flevoland.

Transport and Water. The Regio Randstad Bureau, the secretariat, reports to a Board and Executive Committee (appointed by the Board). The Board is responsible for defining strategic thrusts and associated policies. Each of the public authorities is represented in working parties or advisory bodies. The Executive Committee assures cohesion of effort, and represents the Randstad in consultations with the national government.

The objectives for Randstad development can be grouped into two clusters: (i) improving the quality of physical development and environmental quality in the Region, and (ii) positioning the Randstad to be the key logistics Center of Europe, competing successfully against other European urban systems. In regard to the latter objective, the RRB works closely with the European Regions Research and Innovation Network (ERRIN) and The Network of European Regions and Areas (METREX). Of late, there has been an increasingly outward looking emphasis in RRB's work, i.e., linking the Region closer to Europe, enhancing the Region's dominance as the logistics center of Europe, and marketing the Region. For example, the RRB has an active office in Brussels, the seat of the EU. This shift in orientation is both a product of European integration and globalization (driven significantly by containerization, for which Rotterdam is the global hub), but also reflects the success that has been achieved to date in implementing the domestic agenda for the Randstad.

The Randstad is known world wide for its compact cities, largely within bicycle or tram distance of rail stations, the integration of rail systems and urban development, and its unique shape, particularly its *green heart* which enables residents of all its major cities to be in close contact with green space and water (all but Utrecht are coastal cities). Like most metropolitan authorities in middle-income and developed countries, the RRB is strengthening its major nodes, in this case the leading cities, through a city center (*Randstad Centers*) enhancement program. Approximately 440,000 housing units will be built within existing urban areas in the Randstad between 2010 and 2030, the RRB continues to promote compact growth, made attractive through high quality design. To this end, the national government plays a strong role in designating land for the construction of new communities, working in conjunction with the RRB. Given that the Randstad is a delta environment, much of the Region is land reclaimed from the sea, water resources planning is a priority, the RRB is implementing green and blue corridors throughout the Region to enable residents and visitors to navigate this multi-nodal city of over 7 million people as if they lived in a rural landscape.

European integration is of direct benefit to the Randstad. Its two main ports, Amsterdam Schiphol Airport, and the Port of Rotterdam, are increasingly linked, by rail, expressway, and water corridors, to urban centers in the Netherlands and Europe as a whole. Therefore, new space for the growth of these two ports is crucial, but a major issue. What will be the environmental impacts (noise, wetlands) of extending Schiphol into the sea? The RRB will need to listen to, and respond to diverse opinions on how the Region should be developed, in one of the most densely populated countries in the world.

The tools used by agencies in implementing the policies of the RRB are diverse, e.g., (i) financing of key facilities and city center regeneration, (ii) compensation to land owners for maintaining land in green or environmental service uses (through local authorities), (iii) building and land use controls, (iv) agricultural extension, e.g., regarding soil conservation, and (v) lobbying and promotion in regard to the Region's economic function in the EU.

Although the RRB is centralized in orientation, the national government is attempting to decentralize responsibilities to other tiers of governments, changing its role to one of providing strategic guidance on spatial development, and establishing and enforcing minimum development standards. Regional and provincial government agencies, municipalities, civil society organizations, and interested citizens are encouraged to be involved in the development of RRB policies and initiatives

Key references:

Ministry of Housing, Spatial Planning and Environment (2006), *The National Spatial Strategy*, available online at <www. international.vrom.nl/pagina.html>

Kreukels, Anton, M.J. (2003), *Rethinking Governance with Regard to the Randstad Region, the Netherlands,* a paper presented to Ateliers, Tagungspramm "Handlungsfahige Agglomerationen- (k)eine Utopie?, Lurern, Hotel National, 17 June, 2003

Regt, Ad de (2000), "Randstad Holland: The Delta Metropolis", *Informationen zur Raumentwicklung*, Heft 11/12.2000, pp.691-703

Randstad (2006), *Regio Randstad*: *Cohesion and diversity in an internationally competitive Randstad Holland*, available online at <www.regiorandstad.com/eng>

Related to the emphasis on land use and physical form has been the focus on deploying advanced transportation systems in metropolitan areas (and between them) in Europe to shape the morphology of European urban systems, thereby making them more livable and energy efficient.

Another distinctive features of the European case is the involvement of the supra-national European Union (EU) in support metropolitan governance. This is particularly true in economically depressed metropolitan areas such as Glasgow,[125] which is enjoying a significant revival, but also involves support to the establishment of European wide organizations of Regional Cities (see Box 5).

Much European metropolitan and megapolitan planning is concerned with regenerating areas undergoing severe economic stress, e.g., the Ruhr region in Germany, as well as Glasgow. Economic development is increasingly near, or at the top, of the metropolitan governance agenda of transitional urban economies in Eastern Europe, e.g., Prague.

Overall, the European model is one that stresses the role of national governments, national agencies (such as railroads), and strong planning levers. Civil society organizations often tend to be organized around the interests of disadvantaged groups in metropolitan areas, rather than being driven by business or city building / management professional groups as in the United States.

To a significant extent London represents a deviation from the foregoing continental European model. Although the London Civic Forum (LCF) is focused on disadvantaged groups (similar to Toronto), the London Development Agency (LDA), to a significant degree, epitomizes the economic development orientation of the powerful, formal umbrella agency, the Greater London Authority (GLA). In this sense it is closer to the developmental orientation of metropolitan governance in the United States, but in the London case, government itself takes the lead in assessing and promoting the region's economic development, rather than civil society groups. As indicated by Box 6, London is quite successful in promoting itself as the financial hub of the world (along with New York), and as a contender for the role of global business hub.

[125] OECD, Urban Renaissance: Glasgow: Lessons for Innovation and Implementation, Paris: OECD, 2002
Glasgow Economic Forum, *Glasgow's Continuing Prosperity: A Joint Economic Strategy for Glasgow*, Glasgow: Glasgow Economic Forum, 2003

Box 6

The London Development Agency: *Making Greater London the World's Business Hub*

London is the Europe's top business location, competing with New York to be the world's leading financial center. It attracts more international investment (FDI) than any other European urban region and generates gross value added of over 160 billion pounds a year. The Greater London Authority (GLA), a metropolitan authority, plays a significant role in the metropolitan region's development. GLA was established in 1999 to be a strategic metropolitan-wide government for London and its 14 boroughs. GLA is made up of a directly elected Mayor and 25 assembly members. GLA's main responsibilities include transport (Transport for London), policing (Metropolitan Police), fire and emergency planning (London Fire Services), and economic development through the *London Development Agency (LDA)*; as well as planning, culture, environment, and health. In 2002/2003, the GLA controlled about 49.9 million pounds in expenditure. The London Civic Forum (LCF), a civil society organization, advises the assembly of GLA and other pan-London organizations, build partnerships among different institutions representing London's diverse communities.

The London Development Agency, the high profile economic development arm of the GLA is recognized as a high performance agency, both in the United Kingdom, and in Europe as a whole. Its success in positioning London as a premier global location for high-end services, particularly financial, is well known. Its current goal is to make London the World's financial hub, and maintain its status as one of the World's greatest cities. With an annual budget of 300 million pounds, the LDA promotes business, by working in close partnership with industry, the public, and voluntary organizations and local governments (the boroughs) to support and promote economic development and regeneration of troubled industrial districts in Greater London. The LDA's Board is appointed by the Mayor. It is responsible for preparing the region's economic development strategies such as the current one on "Sustaining Success", released in January 2005. Strategic documents are distributed extensively through partners' networks, including the London Civic and the Black Londoners Forums. To have a multi-cultural and multi-national impact, summaries of documents are translated into a variety of languages such as Turkish, Chinese, Urdu and Arabic.

The LDC also manages a variety of national government funds for local regeneration, skills development, inward investment, and regional innovation. The LDA carried out regeneration projects, and owns land and property, in areas such as the Royal Docks, one of Europe's largest regeneration sites, and at Woolwich Arsenal. Regeneration projects at Silvertown Docks and Wembley are noted for successful partnerships with private sector investors and meaningful consultation with local people. Recently, the LDA has played an integral role in planning to maximize economic benefits from the Olympic Games for London. Especially important in LDA planning is using the Olympic Games as a mechanism to enhance London's profile, and performance as a global business center in the post 2012 period. The LDA faces considerable challenges. Sustaining productivity growth will be difficult, and barriers to employment by disadvantaged groups need to be reduced.. Therefore, the LDA is increasingly focusing on a range of human-centered innovative projects through training, small business support, and town center regeneration, including the Jumpstart program, designed to help Black and minority ethnic businesses.

Key References

Greater London Authority (2006), *About the Greater London Authority*, available online at www.london.gov.uk

London Civic Forum (2006), *About the London Civil Forum*, Greater London Authority, available online at <www.londoncivicforum.org.uk>

London Development Agency (2005), *Sustaining Success: Developing London's Economy, Economic Development Strategy Summary*, Greater London Authority, London.

1.4 The East Asian Experience

It is logical to assume that East Asian metropolitan governance models would be of considerable value to China. This is true in some areas, e.g., fiscal planning; but not in all. For example,

Chinese leaders have expressed interest in civil society based metropolitan governance organizations, rare in East Asia.

Tokyo is of considerable interest because it is the largest metropolitan region in the world (by population), and because it is planned and managed based on a *unicity* model, with the Tokyo Metropolitan Government's area covering the vast majority of Tokyo's built up area. However, some of the issues that Tokyo is facing, in particular demographic decrease and aging, which will translate into stagnant fiscal revenues, will not impact China until the second half of the 21st century, i.e., about 50 years later than in Japan. As noted in Box 7, Tokyo will experience significant fiscal stresses over the next three decades. China should take note of this situation, and countermeasures being taken, because China's metropolitan urban fiscal systems are essentially non-sustainable as currently structured (see Chapter 2).. Although the Tokyo Metropolitan Government (TMG) faces significant challenges over the next decades, many of them exacerbated by the failure to exercise adequate foresight in terms of threats, it has a solid record in terms of effectively shaping urban form (aligning mass rail systems and urban land use), reduction of air pollution, etc. Reforms underway include moving social services closer to the people through decentralization, and more disciplined budgeting processes that will enable resources to be shifted to emerging priorities such as social services required by an aging population.

Box 7

Tokyo Metropolitan Government: *Reform Under Demographic Stagnation and Fiscal Burdens in a Unicity*

The Tokyo Metropolitan Government (TMG) manages the Tokyo Metropolitan region, capital of the world's second-largest national economy, and the world's largest contiguous urban agglomeration, with a population (2005) in excess of 35 million people. The TMG was established in 1991 as a prefecture level public entity encompassing 23 special wards that constitute central Tokyo, 26 cities (*shi*), with populations in excess of 300,000, and 13 smaller entities, towns (*cho*) and villages (*son*).

The TMG is led by a directly elected governor responsible to the legislative body, the Tokyo Metropolitan Assembly (127 members). Reporting to the Governor's office are 17 Bureaus and Offices responsible for line functions, e.g., city planning and finance, as well as six Executive Commissions that essentially act as watchdog or meditating agencies, e.g., the Public Safety Commission, and Expropriation Commission.

The TMG's main responsibilities include service provision such as water supply, sewerage, fire fighting, plus collection of taxes and levies. To reduce spatial disparities in financial resources, the TMG allocates national shared taxes among the wards to ensure that they are all able to deliver core services at a uniform level.

TMG's main challenge is a growing financial deficit that will be worsened by Japan's declining population. Japan, according to conservative UN populations, will lose 8 million people between 2005 and 2030. Population will stagnate in Tokyo over the next decades, as acknowledged by the TMG. Aging, creating higher demographic dependence (a smaller labor force), will compound the economic, and especially fiscal (lower tax revenues, higher social expenditure), implications of demographic stagnation. By the end of fiscal 2002, TMG had seven trillion yen in outstanding metropolitan bonds and had run a deficit for five consecutive years. Since the TMG raises about 66% of the total metropolitan revenue (national treasury disbursements account for only 7.9%), and the national economy will be impacted even more severely by demographic decline, it is largely the TMG itself that must address this pending fiscal crisis.

A recent study by the TMG Bureau of Finance, released in 2005, clearly outlines the dramatic implications of a status quo metropolitan finance simulation. Assuming, optimistically, no population growth, it is estimated that revenues will only grow by 0.2 trillion yen, necessitating a 0.7 trillion reduction in expenditures over the status quo expenditure forecast. Since population growth in the TMG is unlikely, significant changes in the mix and extent of expenditures will need to occur, especially given the need to address problems of an aging population, outlined in the TMG's, *Tokyo Vision for a Health and Welfare City*. The Bureau of Finance is acting, establishing indicators to encourage fiscal discipline, and initiating budgeting processes that focus on drastically changing medium and long-term perspectives to provide context to annual budgeting processes.

Other key components of fiscal reform are to: (i) address the three critical areas of *transparency, reliability and efficiency*, and (ii) decentralize functions, especially those that touch closely on people's live, to the special wards, e.g., jurisdiction over waste management. It is expected that decentralization will lead to more disciplined and targeted expenditure.

The Tokyo Metropolitan Region is governed by the largest metropolitan government in the world, unique in that it is encompasses most of the built-up area, i.e., it is a unicity. It has performed well in many areas including city planning, environmental enhancement, and disaster planning (for earthquakes). On the other hand, the TMR is a perfect example of how apparently successful routine metropolitan planning can be totally disrupted by strong external drivers, in this case a dramatic decline in fertility, combined with national policies that restrain immigration. The case of the TMR indicates that metropolitan governance must always be alert to the big picture, and rapid changes in context.

Key References:

Tokyo Metropolitan Government (2006), *Overview of Tokyo*, available online at www.metro.tokyo.jp
Tokyo Metropolitan Government (2006), *Principle Policies of the Tokyo Metropolitan Government*, available online at www.metro.tokyo.jp
Tokyo Metropolitan Government (2006), *New Guidelines for Administrative and Fiscal Reform*, available online at www.metro.tokyo.jp

As indicated by Box 8, Seoul's metropolitan governance system is structured considerably differently from Tokyo's. Firstly, the Seoul Metropolitan Government (SMG) governs less than half the population of the extended urban region, known as the Seoul Metropolitan Region (SMR). The national government, through the Prime Minister's office, takes the lead in co-ordination of planning and service delivery that involves cooperation between the SMG and the surrounding local governments that constitute the SMR. Nevertheless, the system works well. In the SMG, a shift toward qualitatively oriented growth management benefits from pro-active public corporations. Similarly, cooperation between the SMG and the SMR benefits from establishment of Committees and Associations, often catalyzed by the national government.

Box 8

Seoul Metropolitan Government: *Leadership from the Metropolitan Core*

The Seoul Metropolitan Area (SMA) constitutes the core of the Seoul Metropolitan Region (SMR), the latter a megapolitan area containing 48% of South Korea's population (23 million). The SMR typifies extended urban regions in East Asia, it is nineteen times as large in area as the SMA, with an area of 11,773 square kilometers. Over time, an increasing proportion of the SMR's population lives outside the SMA; in part because SMA's area has been extended only slightly between 1963 and 2004 (from 595 to 605 sq. kms.), combined with the fact that the population of the SMA peaked in 1992 at 11 million, declining to 10.3 million by 2004 through suburbanization and peri-urbanization processes.

Within the SMA, the city's efficiency has been increased substantially through the establishment of public corporations, e.g., the Seoul Metro Corporation and the Seoul Metropolitan Rapid Transit Corporation, which are responsible for 9 subway lines, the Seoul Housing Corporation responsible for ow income housing, and the Seoul Metropolitan Facilities Management Corporation, responsible for car-only roads and parking facilities. The SMG is now focused on quality of life, given that efficiency objectives have largely been achieved. This shift is described as a shift from a growth oriented (quantitative) model to a growth management (quality) model. The latter includes restoration of historic, cultural, and natural environments. Related to the latter, Seoul has attracted global attention by restoring Cheonggyechon Stream which runs through the heart of the city. This has involved removal of an expressway (that covered it) – a cost deemed worth it, given the shifting values of SMA residents as they grow richer.

Megapolitan governance is based on three tiers: the SMR, SMG and the Districts. Typical of extended urban regions such as Bangkok and Toronto, the SMR has limited powers, especially in terms of service delivery. The national government takes the lead in economic, demographic, and spatial planning for the SMR, through the Capital Region Management Committee, chaired by the Prime Minister. At present, the second Capital Region Management Plan 1997-2011, based on the Capital Region Management Act of 1982, establishes basic parameters for the region, e.g., land use and urban form (promoting a multi-nuclei structure), industrial distribution, and national government capital investments. The twenty-five Autonomous Districts undertake their own locally derived projects under a certain scale (e.g., roads less than 20 meters wide, sewage pipes under 900 mm), plus those commissioned by the SMG. The mayor of each District is also elected.

Cooperation between the SMG and surrounding jurisdictions has resulted in positive outcomes, e.g., the establishment of the Capital Region Transport Association, which co-ordinates 397 bus routes carrying 8.8 million riders daily in Seoul, Gyonggi and Inchon. Of particular note is the initiative to improve water quality in the Han River, which flows through Seoul. The Committee for the Management of the Han River Water Quality allocates zero costs to the two furthest upstream jurisdictions (Gangwon, Chungchung), whereas downstream communities share the vast majority of costs, aided by a matching grant from the Korea Water Resources Corporation. In effect, the downstream communities provide upstream jurisdictions with a subsidy for performing environmental services.

From 1998 to 2001, SMG implemented a series of reforms such as the citizen evaluation system, on-line procedures to handle civil service applications (the *open* system), and performance based budgeting. The reforms were implemented immediately after the East Asian financial crisis of 1997, when people were receptive to change. The citizen evaluation system (requiring quick internet response from the responsible official) and anti-corruption index were recognized as "the most valuable reform" by the Presidential Commission on Governmental Innovation in Korea.

Metropolitan Seoul indicates that even when the metropolitan area cannot be expanded to keep up with peripheral population expansion and movement of population to suburban and peri-urban areas, coordination of development can be successful. In the Seoul case this coordination is catalyzed by the national government.

Key References:

Kim, Byong-Joon (2004), An Assessment of Seoul Metropolitan Government Reform Strategies, *International Review of Public Administration*, vol.8, no.2, pp.77-89

Metropolis (2006), *Seoul Metropolitan Region Profile*, available online at < http://www.metropolis.org/index.asp>

Seoul Metropolitan Government (2006), *City Government*, available online at < http://english.seoul.go.kr/gover/main/gover_main.htm>

1.5 Overall Learning: Relevance to China

What key lessons that can China derive from the international experience to improve the effectiveness of its metropolitan and megapolitan governance systems?

(i) In terms of metropolitan governance structures, it is important to *stay ahead of expansion of the built up area*. For example, Toronto, Seoul, and Bangkok, all have strong and relatively effective metropolitan governments, but in every case at least 45% of the extended urban population live outside the boundaries of the metropolitan government. Expanding metropolitan areas is not easy. Vested interests in jurisdictions that will be amalgamated, or have changed roles within a larger institutional construct, are likely to oppose change, but it is necessary because the majority of physical and demographic growth occurs on the periphery of metropolitan areas, often outside the purview of existing metropolitan governments. In China, the implication is slightly different. Since Municipalities generally over bound metropolitan areas, the issue is one of integrating existing jurisdictions into the Municipal Governance system earlier rather than later. This means that Counties should be upgraded to Urban Districts, which are more directly integrated into the Municipal Government system, ahead of their large-scale urbanization.

(ii) Metropolitan systems are not only large in scale, but are usually much more linked to the outside world than smaller cities. This is a net plus, but also makes them more *vulnerable to changes in global economic systems*. Equally important, big swings in domestic drivers are writ large in metropolitan areas, as the case of Tokyo illustrates. Thus good metropolitan governance cannot consist solely of routine administration of internal urban systems, e.g., providing sewerage. Rather, metropolitan governance systems have an obligation to constantly monitor and anticipate the larger context in which they operate, identifying and responding to major shifts in global and national economic, socio-demographic, technology, and political drivers. If not, there is a high probability that the city will be blind-sided by an event or driver that could have been anticipated, but was not. Recent cases of metropolitan areas being blind-sided include New Orleans (flooding), Sao Paulo (gang led civil unrest), Tokyo (demographic decline and aging), Jakarta (terrorism), French urban areas (ethnic conflict based civil unrest), etc.

Experience also indicates that development of civil society in metropolitan regions, although it takes time to build, improves resilience. For example, Bangkok coped relatively well after the 1997 East Asian financial crisis because of micro adaptation throughout the system, built on a strong civil society.[126]

(iii) It is important that metropolitan governance systems *allocate functional mandates effectively*. Based on the international experiences presented, this generally means decentralizing functions that are best delivered close to the people, e.g., social support, basic education and training, and primary health care; while delivering strategic planning, regional-scale trunk infrastructure, economic development planning, and marketing at the metropolitan scale. Changes in the vertical allocation of mandates require reform of fiscal structures, either through intra-metropolitan (or national) transfers, and/or through re-allocation of revenue generation powers. For example, many social services are labor intensive and expensive, meaning decentralization of such services within metropolitan regions places an increased fiscal burden on Districts, or equivalent lower level jurisdictions.

[126] Webster, D., "The Future of Thai Urbanization: New Drivers, New Outcomes" in Warr, P., *Thailand Beyond the Crisis*, London: Routledge, 2005

(iv) Metropolitan governance faces a dilemma. *Large scale finance is needed for development of infrastructure systems ahead of settlement*, to structure urban systems through use of infrastructure. Infrastructure led development is especially important on the periphery, to avoid the high costs of retro-fitting the urban fabric. Large scale infrastructure investment should not be overlooked in built-up areas, e.g., heavy rail systems can literally restructure existing cities, generating high density nodes, etc. Yet, at the same time, large-scale borrowing, or de facto off-budget financing through issuance of concessions, involvement in joint ventures, etc., can create problems, e.g., in Osaka. Good practice, well-documented by the World Bank and others, needs to be adopted, e.g., assuring future revenue streams meet finance costs, borrowing in the same currency as the revenue stream, assuring adequate future demand for the facility in question, etc.

(v) International experience indicates that very substantial intra-metropolitan fiscal disparities can develop. This is because different areas of a metropolitan area have widely varying economic bases, and secondly, residential populations tend to be clustered by socio-economic class. The problem is exacerbated if richer communities split off to protect their tax bases, as in Los Angeles, with particularly negative implications in terms of education. Another cause of fiscal disparities is that some jurisdictions provide environmental or recreational services, land uses that often generate low fiscal yields. Even in Minneapolis – St. Paul, a metropolis with a progressive fiscal transfer system, substantial fiscal disparities exist.

Given the need for economic specialization within metropolitan areas, and the fact that the whole metropolis benefits from high quality local services, e.g., education, and region-serving environmental and recreational services, *horizontal fiscal transfers within metropolitan areas often make sense*. The need for transfers may also by generated by the need for *vertical re-distribution* of fiscal resources if mandates are changed, as noted above (iii).

The danger is that fiscal transfers have the potential to reduce local fiscal and service delivery performance if incentives to generate local revenues are reduced too much, as is sometimes the case, e.g., Manila and Jakarta. Or, often in tandem, poorly designed fiscal transfers may reduce the incentive to spend prudently.

In sum, international experience indicates that intra-metropolitan fiscal transfers can be useful, but need to be designed carefully to minimize creation of disincentives and environments that generate moral hazard.

(vi) International experience indicates clearly that *one size does not fit all*. Even within nation states, e.g., Canada or the United States, there is wide variance in the structure and processes of metropolitan governance. This is positive and has relevance for China. For example, in West China, a more top-down integrated metropolitan development model may be more feasible than in coastal areas where other mechanisms may be more effective, e.g., a federation of local governments approach, supported by matching grants to create incentives for co-operation among horizontal units.

Often metropolitan governance systems are a reflection of national or regional culture. For example, in Canada there is an emphasis in metropolitan governance in delivery of social services and meeting the needs of the large numbers of migrants, who gravitate to metropolitan

areas. In the Netherlands, the emphasis is on managing the densely populated environment; in Chicago and London, aspiring world cities, considerable weight is place on economic performance.

(vii) A major lesson from international experience, particularly from the United States, is that *civil society can play a very important role in metropolitan governance*. As indicated, metropolitan strategies, promotion, and urban redevelopment, is driven by civil society organizations in major metropolises such as New York and Chicago. The fact that these successful metropolitan organizations are led by business or professional groups (e.g. architects, city planners) has implications for China. Approaches such as those pioneered in New York and Chicago could provide important clues in implementing first stage civil society involvement in metropolitan governance in China.

In metropolitan areas such as London, Toronto, and Chicago, prime destinations for international migrants, metropolitan-wide civil society groups play an import role in metropolitan governance by representing disadvantaged groups, e.g., migrants, disadvantaged ethnic groups, the less skilled. Because such groups often have limited voice in traditional representational democracy, by involving them in civic organizations at the metropolitan scale, the overall efficiency of the metropolitan system can be improved, e.g., through a more skilled labor force, lower crime rates, less social conflict, etc. Over time, China may want to consider incorporating such civil society mechanisms into the metropolitan governance system.

(viii) An important lesson from international experience is that *periods of crisis often provide opportunity to reform or restructure metropolitan governance*. Timing is very important in changing metropolitan governance systems. The case of Seoul indicates this principle clearly. Similarly, New York, facilitated by the RPA, has followed up on crises, e.g., the 9/11 terrorist attack, and before that New York's bankruptcy, to undertake large-scale initiatives. Metropolitan governments often perform better under stress, e.g., Toronto during the SARs crisis, the Bangkok Metropolitan Administration that trained over 100,000 people, planted over 300,000 trees, and rehabilitated hundreds of schools in the post 1997 financial crisis period.[127]

(ix) *Virtually all metropolitan governance systems are concerned with spatial structure, which can only be shaped effectively at the metropolitan scale*. In every case studied, strategies exist to create several strong urban centers (to complement the Central Business Districts) within the metropolitan fabric. As petroleum becomes more expensive, and there is more concern over long commutes (to reduce air pollution and human time costs), this issue area will become even more important in metropolitan governance.

[127] Webster (2005)

Chapter 2 Governing China's Metropolitan Regions: Status, Issues, and Policy Implications

2.1 Introduction

This Chapter addresses impediments to more effective metropolitan and megapolitan governance in China, and suggests potentially feasible initiatives for change. Suggested initiatives require further assessment. The initiatives proposed are those that would likely yield the highest benefits in terms of improved metropolitan performance (economic output, environmental status, energy efficiency, household well-being and quality of life).

Improved metropolitan governance in China would yield significant economic, environmental and social outcomes for two reasons: (i) there is considerable potential for obvious quick gains, e.g., more rational routing of network infrastructure such as roads and sewer lines within metropolitan regions, and (ii) Metropolitan regions account for an increasing percentage of China's economic output, population, and land area, thereby multiplying benefits from more effective governance.

Extended Urbanization: Metropolitan and Megapolitan Regions

In this Chapter, the emphasis is on *Metropolitan Regions*, which in China generally are located within one Municipality, i.e., the built up metropolitan area is almost always smaller in size than the Municipality.[128] Such metropolitan systems are composed of *Urban Districts* (which constitute the *City Proper*), *County Level Cities*, and parts of *Rural Counties*. We define metropolitan regions as Municipalities containing relatively contiguous urban populations in excess of 1.5 million people.

However, it is recognized that a larger scale of extended urban regions is emerging in China. These urban systems contain more than one metropolitan Region. Leading examples include the Pearl River Delta (PRD), the Lower Yangtze Delta (LYD), which is 100,000 square kilometers in area, and includes parts of Jiangsu (to Nanjing) and Zhejiang (to Ningbo) Provinces; and the Beijing-Tianjing Region (BTR)[129], which is 30,000 square kilometers in area, and covers parts of three Provinces (including parts of Hebei Province). (See Map 1.) We term these regions, *Megapolitan*. In addition, nine other megapolitan regions exist, or are rapidly emerging in China, see Map 2.

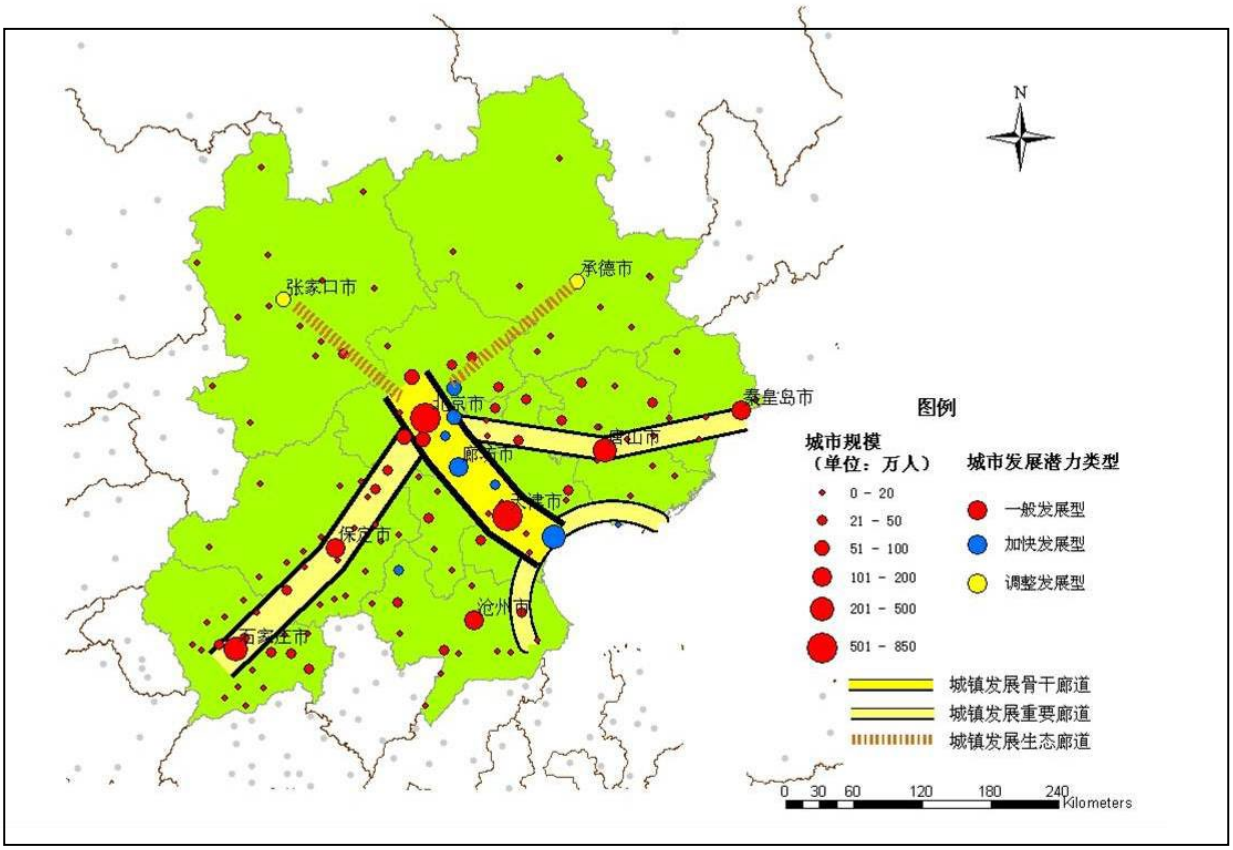
We define *Megapolitan Regions* as extended urban systems that contain more than one metropolitan Region that are linked economically, i.e., in terms of flows of people, inter-industry linkages, recreational patterns, etc. Although Chinese authorities have not yet officially put forward criteria defining megapolitan Regions, their existence is de facto recognized, e.g., in the analysis of extended urban systems in the Eleventh National Development Plan. As a starting point, we use criteria being developed in the United States to define Chinese megapolitan Regions, namely a population larger than 10 million people, and the existence of at least two metropolitan Regions, linked through significant economic or physical flows. (Robert Lang

[128] This situation is typical of transitional economies in Communist states, e.g., Vietnam.

[129] Not to be confused with the Bohai Bay region, which is much larger, incorporating the Beijing – Tianjin Megapolitan Region as a relatively small percentage of its total area.

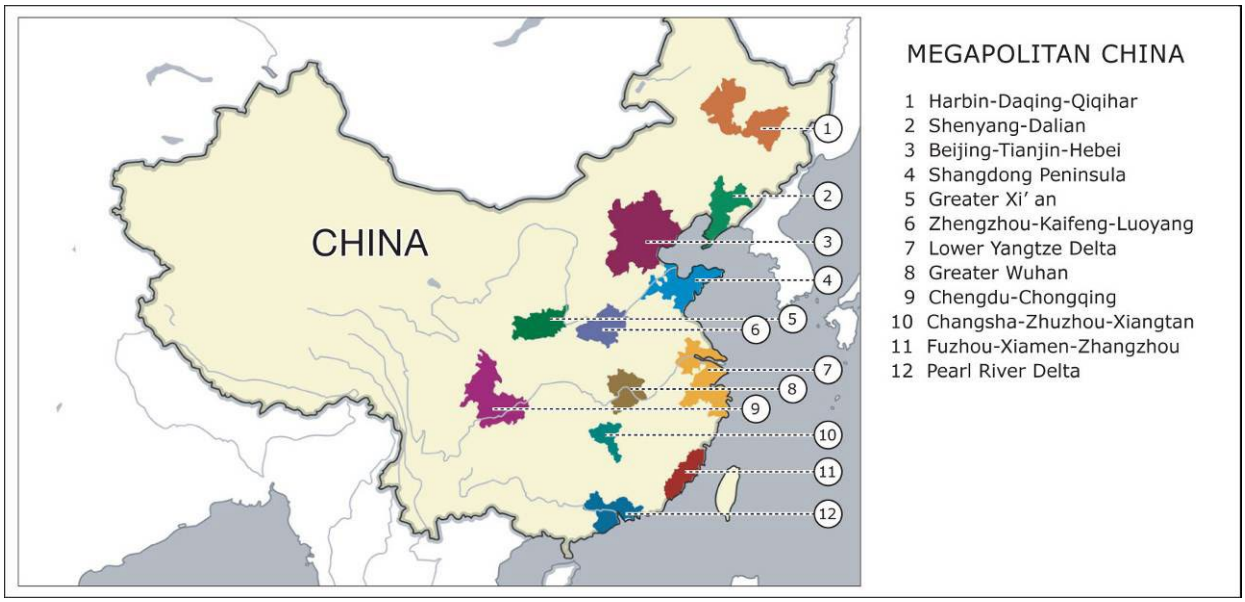
outlines detailed criteria in the case of the United States.[130]) Map 2 was constructed using these criteria. Invariably, in China, these megapolitan Regions encompass more than one Municipality, Province and/or Special Administrative Region (SAR), the latter in the case of the Pearl River Delta.

Map 1: Conceptual Plan: Beijing – Tianjin – Binhai New Area



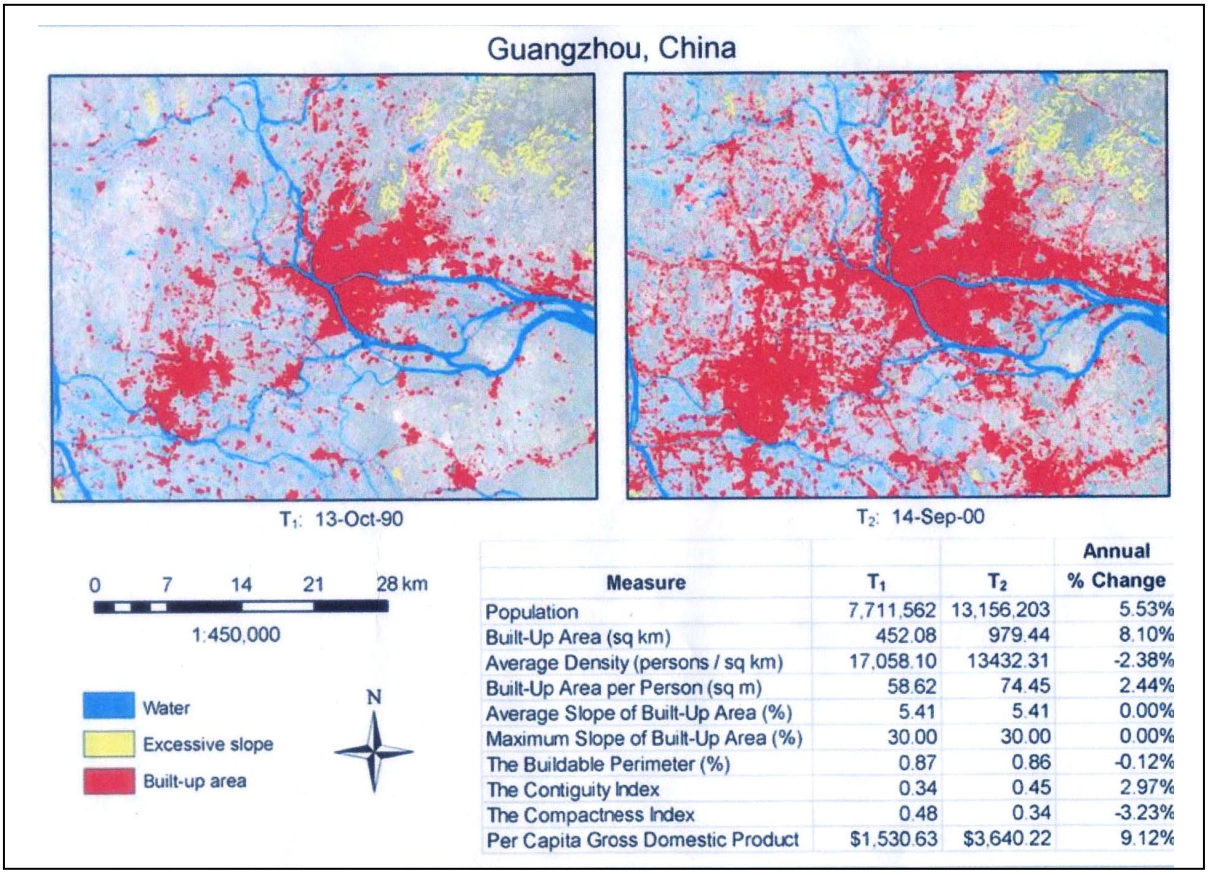
[130] Lang, Robert and Dawn Dhavale. 2005. *Beyond Megalopolis: Exploring America's New "Megapolitan" Geography*, Virginia Tech: Metropolitan Institute, Census Report 05:01, July 2005

Map 2: Existing and Emerging Megapolitan Regions in China



The average Municipality in China is large, about 10,000 square kilometers, or about four times as large as the average metropolitan municipality worldwide. Thus, as noted, over bounding of urban systems is the rule. For example, metropolitan Guangzhou, with a population of 13.2 million (2000), had a built up area of only 979 square kilometers and a total urban area (defined by drawing a perimeter around the outer edges of contiguous development plus urbanized/linked patches) of about 2,500 square kilometers. (See Map 3.) Although a significant net benefit, because it makes co-ordinated planning and delivery of services to the whole built up metropolitan area feasible, over bounding does have negative impacts. Over bounding results in the Municipal Government (and its constituent jurisdictions) having fiscal responsibility for rural and emerging peri-urban areas, that are expensive to service, especially if rural residents demand equivalent to urban levels of service. However, a countervailing benefit is there are fewer "not in my backyard" (NIMBY) disputes within Chinese Municipalities, e.g., siting of landfills, which can be virtually impossible in under-bounded systems, such as Bangkok or Manila, where nearby jurisdictions do not want to take on "nuisance" land uses generated by jurisdictions within the official metropolitan area. The relative lack of NIMBY disputes in China also reflects state ownership of land, and relatively weak civil society, discussed above. With the development of civil society, NIMBY type disputes may increase.

Map 3: Guangzhou Metropolitan Area



Measure	T_1	T_2	Annual % Change
Population	7,711,562	13,156,203	5.53%
Built-Up Area (sq km)	452.08	979.44	8.10%
Average Density (persons / sq km)	17,058.10	13432.31	-2.38%
Built-Up Area per Person (sq m)	58.62	74.45	2.44%
Average Slope of Built-Up Area (%)	5.41	5.41	0.00%
Maximum Slope of Built-Up Area (%)	30.00	30.00	0.00%
The Buildable Perimeter (%)	0.87	0.86	-0.12%
The Contiguity Index	0.34	0.45	2.97%
The Compactness Index	0.48	0.34	-3.23%
Per Capita Gross Domestic Product	$1,530.63	$3,640.22	9.12%

Source: Angel, S, Sheppard, C. and Civco, D., et al, 2005

The Economic and Demographic Significance of Metropolitanization

The current and future importance of metropolitan and megapolitan regions in China is indisputable. In particular, the share of national economic output accounted for by megapolitan Regions is forecast to grow rapidly. For example, by 2020, the PRD, LYD, and BTR megapolitan Regions will account for 65% of Chinese economic output. Although the population share of these megapolitan Regions is, and will be, smaller than their share of economic output, they will still account for 18% of China's population. In 2020, the population of these three megapolitan regions will be BTR 85 million, YRD 100 million, and PRD 80 million.[131]

China in 2004 contained 283 Prefecture (Municipal) cities, the vast majority of which contained over one million people in their extended urban regions, i.e., they are current or emerging metropolitan systems. As indicated by Table 1, these 283 Municipalities covered 49% of China's land area but contained 91% of the population. Urban Districts in these 283 Municipalities contained 6.1% of China's land area, 27% of the population, and accounted for 67% of the GDP. Map 4 describes the spatial cover of these Urban Municipalities – essentially eastern China is urbanized, while the West is not, an expected outcome given the overall geographic distribution of the Chinese population. Rapid population growth in most metropolitan Regions, and all megapolitan Regions, will continue to be driven by net in-migration plus envelopment of surrounding rural and town settlements by outward spread of these urban systems. Net urban in-migration is highly concentrated in larger urban systems.

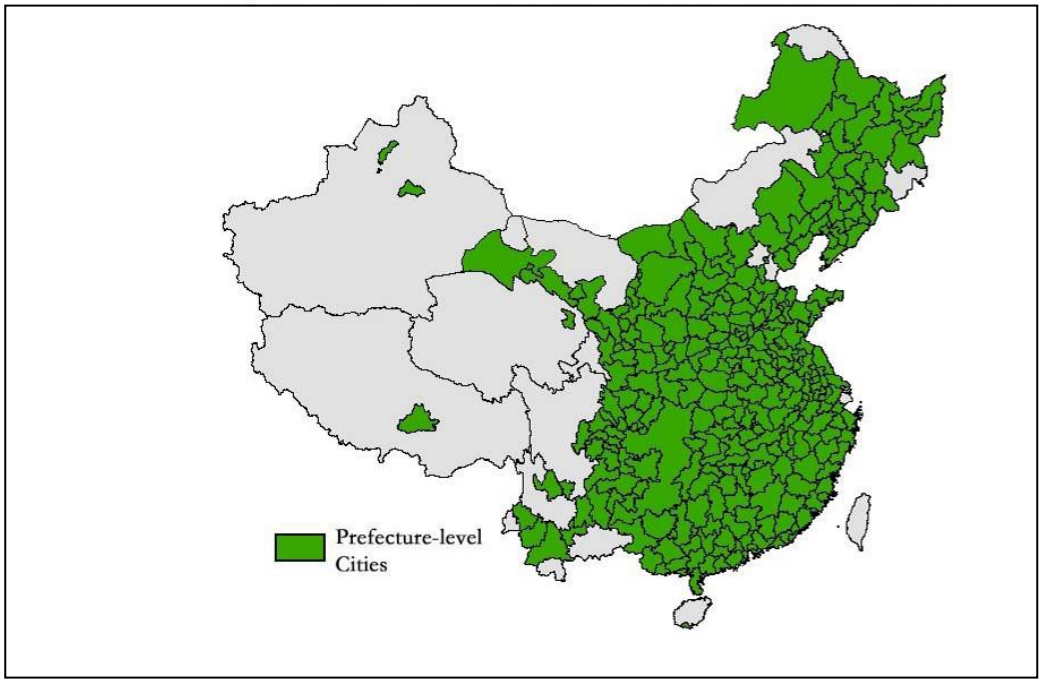
Category	Percent of total population %	Percent of total Land Area %	Percent of Total GDP %
Prefecture Level Cities	**90.6**	**48.9**	
Urban Districts	**27.0**	**6.1**	**67.0**

Table 1: The Spatial Distribution of Prefecture Level Cities (283) in China in 2004

Note: The above table was prepared from two data sets that are not aligned: China's Statistical Yearbook 2005, and China's Urban Statistical Yearbook 2005.

[131] Population forecasts are from the National Construction Commission; economic forecasts are from the China City Development Report (2002-2003).

Map 4: Spatial Cover of Prefecture-level Cities (283) in China in 2004



The increased economic and strategic importance of metropolitan regions in China is being driven by accelerated integration of the national economy, e.g., emergence of nation-serving corporations such as Haier (consumer appliances) and Youngor (retail clothing), national financial systems; dynamics which have been significantly facilitated by dramatic improvements in the national expressway system (see Map 5), and communications and aviation systems. High Speed Rail (HSR) networks, soon to be developed between major megapolitan Regions, e.g., Shangahi – Beijing and Shanghai – Hangzhou, will reinforce integration of the national economy, favoring the largest urban systems in China.

Map 5: Expressway Network in China: 2020

Spatial Implications of Metropolitanization

This rapid increase in the importance of metropolitan and megapolitan Regions will obviously translate into (i) increases in built up area, and (ii) extension of the perimeters of urbanized areas. The latter is more difficult to forecast than built up area per se, given that urban systems expand in a patchwork way, providing opportunity for later in-filling that in the case of large metropolitan areas can literally absorb millions of people. For example, Chengdu has experienced considerable infilling, limiting expansion of its perimeter over the last decade, as has Los Angeles in the United States, which is densifying at a rapid rate (it is physically bounded by mountains and the Pacific Ocean). Guangzhou, China, a metropolitan region within the PRD Megapolitan region, illustrates these dynamics, based on recent analysis by Angel, et al.[132] The built up area of the Guangzhou metropolitan system more than doubled between 1990 and 2000 (from 452 square kilometers to 979 square kilometers, 8.1% per year, faster than the population growth rate of 5.5%) yet the outer perimeter of the system changed little, resulting in an increase in the Contiguity Index (from 0.34 to 0.45) and a reduction in the Buildable Perimeter Indicator (from 0.87 to 0.86). At any rate, there will be expansion in the physical size of metropolitan Regions in China, albeit with considerable variance across urban systems, which will increase the number of local administrative jurisdictions that are part of metropolitan and megapolitan regions, further complicating metropolitan governance, but at the same time, increasing pressure for improved metropolitan governance.

The Challenge

Given the dynamism and increased importance of Chinese metropolitanization, creative thinking is needed to identify new governance measures to address stresses and opportunities associated with rapid growth. Our analysis indicates that the overall institutional and spatial structure of metropolitan government in China requires little change. For example, as noted above, Municipalities tend to be of appropriate geographic size. However, what is needed is a reconsideration of powers assigned to different levels of urban government (Municipality, Urban Districts, Counties, Townships, Provinces, etc.), and even more important, a reexamination of incentive structures facing major public actors operating at a metropolitan scale. For example, local jurisdictions need incentives to ensure that road and waste water systems are rational to serve the metropolitan region, and their own jurisdiction, at lowest cost.

At the megapolitan scale, a different set of challenges exists. Megapolitan regions are recognized by national planners, e.g., the National Development Reform Commission (NDRC), and in the Eleventh National Development Plan, but do not officially exist, despite the fact that Municipalities and Provinces are now co-operating in producing Megapolitan Region Plans, e.g., the BTR plan, and holding regular coordination meetings, e.g., in the LYD. The challenge is to define and implement an appropriate level of formal and informal institutional organization and processes to guide development of China's megapolitan Regions.

2.2 Key Issues Assessment

2.2.1 One Stakeholder Model of Metropolitan Governance

There is limited involvement of civil society in metropolitan governance in China. Currently, governance is essentially based on a one stakeholder model, that is the vertical, and largely

[132] Angel, S., S. Sheppard, and D. Civco, *The Dynamics of Global Urban Expansion*, Washington: The World Bank, 2005 p 131

hierarchical, structure of local government, described above, determines public sector resource allocation and initiatives. However, in the more economically developed regions of China, the private sector, through local branches of trade and industry organizations is becoming more involved in metropolitan governance, especially on issues of high concern to these stakeholders, e.g., metropolitan transportation systems and facilities (such as ports). In some cases, multi-national corporations, usually based in Economic and Technological Development Zones (ETDZs) and High Technology and Science Zones, and/or large domestic corporations (such as in Qingdao) play an increasing role.

Given the Chinese situation, and global experience, it appears that business or urban development professionals led civil society groups would initially have the greatest credibility and value in terms moving toward a multiple stakeholder model of metropolitan governance in China.

2.2.2 Vertical Realignment of Local Government Powers

The powers of local governments in China (Municipalities, Urban Districts, Counties, Townships, etc.) are based on the Chinese Constitution. However, local functional mandates are not defined in the Constitution, functional mandates are ambiguous, accordingly the same function is often undertaken by more than one level of government. Furthermore, the actual functions of different levels of local government among metropolitan areas vary widely. This is attributable to wide differences in political networks, charisma / guanxi of local officials, and differences in fiscal resources (discussed above) among local governments.

In general, Municipalities in the Interior, and especially in the West, exercise more power relative to Counties, Urban Districts, etc., making metropolitan-wide planning and management more feasible away from the coast. This is largely the result of the private sector, and urban economic development as a whole, taking off at a later date in the West, enabling Municipal Governments to play a stronger role. On the other hand, especially in the coastal metropolitan areas, and to a lesser extent, Beijing Municipality, rapid County (and even Township) based private sector led economic development (including FDI driven development) gave lower level urban governments more fiscal power, putting less onus on Municipal Governments to deliver metropolitan wide services. This occurs despite the fact that plans (economic, physical) need to be approved by the People's Congress of the jurisdiction in which they are to be enacted, plus the next level up, e.g., an Urban District's plans need to be approved by the Municipality. (Final approval, by the national State Council [a quasi legal body] is usually a rubber stamp procedure.)

Our assessment is that Municipalities need more power relative to Counties and Urban Districts over: (i) overall strategic direction (SWOT Analysis, Vision formulation and, Strategic Planning), (ii) economic development planning, (iii) structural physical planning (e.g., functions of CBDs and suburban Centers, major green spaces, major corridors), (iv) routing/location of key facilities and trunk infrastructure (such as expressways and arterial road systems, rapid transit systems, trunk water supply and sewerage lines), and (v) promotion and marketing. All of these functions, as well documented in the urban planning / management literature, benefit from a combination of: (i) economies of scale and agglomeration, (ii) rational network design, and (iii) positive synergies, e.g., between economic development and infrastructure investment and between land use and transportation systems; implying planning and often, implementation,

should occur at the metropolitan scale. Analysis of Chinese metropolitan systems reveals considerable inefficiency resulting from too little Municipal authority in the foregoing areas. For example, in Xiamen Municipality, suburban centers (County Level Cities) on the mainland duplicate functions among themselves, undermining metropolitan economic efficiency by creating over capacity in functions such as industrial zones, extremely expensive infrastructure. Harbin, on the north side of the river, appears to be investing in excessive urban infrastructure, given relatively slow demographic growth in the metropolitan Region. Wastewater trunk lines, as in Shanghai, may take circuitous routes, avoiding the nearest suitable location to treat or discharge treated waste water, to avoid crossing boundaries of (rival) Districts.

On the other hand, a strong case can be made that Urban Districts and Counties should be given more powers to deliver social services that operate best when in close contact with users, e.g., basic education, local policing. (Municipal, Provincial, and National level [as appropriate] agencies would need to ensure that these services are being delivered to standard by lower level urban governments, through monitoring and enforcement of standards.) Social services noted do not benefit from economies of scale (beyond fairly low thresholds) and are not based on hard (physical) networks. Because social service delivery requires substantial fiscal resources, given the labor intensiveness of these services, strengthening of the social delivery function at the local level would require appropriate increases in fiscal resources, at the County and Urban District scales, either through increased transfers or enhanced revenue generation powers.

At present, allocation of functions is often sub-optimal, e.g., low level governments such as Townships build industrial parks for economic clusters that may have metropolitan wide implications, e.g., in terms of efficiency of traffic flows and labor markets, while Municipal Governments deliver social services that could be delivered on a more locally customized basis by lower level governments that are closer to the people. Such a shift in functions would not necessarily mean that any level of Government gains considerable influence. Although Urban Districts and Counties might gain fiscal power, the Municipality would gain strategic influence, increased powers to enforce standards, etc.

It is our assessment that the Township and Urban Block levels of governance should be weaker at the metropolitan level (i.e., in terms of investment, planning), except in one regard – as a mechanism and conduit for citizen input. Townships, Counties, and Urban Districts, are closer to the people than are Municipal Governments, which serve very large areas, and millions of citizens. Citizen and civil society input from the lowest levels of metropolitan jurisdictions, e.g., concerns about specific local issues such as siting of firms and environmental facilities, neighborhood transportation flows, would come from individuals plus local groups such as schools, interest groups (environment, women, labor), universities, private enterprises and enterprise associations, etc. This input could be digested by the existence of metropolitan wide civil groups (such as the RPA in the United States), plus the Municipal Government itself.

A problem in the current system is that when Counties become Urban Districts they generally lose fiscal power – Counties are more autonomous within Municipalities than Urban Districts, especially in budgetary and fiscal matters. Thus there is a built in incentive for Counties (usually County Level Cities), even when enveloped by metropolitan expansion, to resist amalgamation. For example, this was the case in the ultimately successful amalgamation that occurred in

Hangzhou Municipality (although concessions were made in terms of the fiscal autonomy of amalgamated Counties in the Hangzhou case). However, in a minority of cases, Counties may desire to become an Urban District, as has been the case in the upgrading of some Counties in Beijing and Shanghai, because of more direct access to the revenue stream of rich Municipalities, despite losing considerable autonomy.

2.2.3 Fiscal System Complexity[133]

Official fiscal systems / budgets often represent half or less of public funds being processed by Municipal and County Governments. Although official budgets are often quite transparent, many urban jurisdictions publish them in the local newspaper; off-budget activity is usually obscure. This situation, two fiscal systems, and lack of transparency in off-budget activities, makes rational programming-budgeting, including capital budgeting, more difficult at the metropolitan scale. For example, large numbers of concession-type agreements, e.g., toll roads, are awarded on an ill-advised ad hoc basis, making regional travel expensive, and inefficient, due to incrementally designed networks. As has been well documented, off-budget activity is fueled significantly by revenue from land lease sales, concessions, etc. Reforming Municipal scale fiscals systems would be a major task. However, the existence of accurate information regarding the fiscal status of metropolitan Regions would make metropolitan governance more effective. For example, accurate information is needed to effectively realign functions among levels of local government.

Notwithstanding the above, it is clear that current fiscal incentives distort metropolitan performance, particularly in terms of the intra-metropolitan spatial economy. Sub-Municipal units chase manufacturing because this is the route to maximizing local revenue from shared taxes (a nationally administered system). Because property taxes do not exist, and local governments receive a very small share of personal income taxes, revenue from corporate taxation and taxes on differing types of manufacturing output (excise taxes) become proportionately very important. The importance of these shared revenue streams from manufacturing is illustrated by the willingness to lease land at very low rates to manufacturing firms to generate ongoing revenue. The result is that manufacturing is scattered among a large number of ETDZs, High Tech Zones, County and Township industrial parks, etc. Accordingly, in a typical metropolitan Region, more land is allocated to manufacturing than is justifiable. This can have costs, e.g.: (i) Negative externalities on surrounding neighborhoods if the activity is not clean, (ii) Higher costs of wastewater treatment from scattered manufacturing facilities, (iii) Loss of innovation and learning resulting from the geographic separation of firms in the same economic cluster (as is the case of the aviation cluster in Chengdu and the pharmaceutical cluster in Harbin), and (iv) higher time costs as commuters move through ill-located manufacturing complexes when commuting. (v) Another negative impact is that local government jurisdictions that fail to attract manufacturing often do not have sufficient fiscal resources to implement otherwise desirable programming.

[133] For background information on this topic see:
Asian Development Bank / Ministry of Finance China, *Managing Urban Change: Strategic Options for Municipal Governance and Finance in China*, Beijing and Manila: Asian Development Bank, 2000, and
Choi, Songsu, et al, *China: Development Issues and Strategies for Towns*, Washington: World Bank, 2005

This distortion also operates at the megapolitan scale, an issue that has raised considerable attention in the Chinese press of late, in the case of the LYD. There, Shanghai's outlying Urban Districts[134] do not want to give up their manufacturing bases for the fiscal reasons described above, whereas second-tier cities in the Megapolitan Region, e.g., Ningbo or Suzhou, would be more appropriate locations for manufacturing in terms of national competitiveness (given lower costs, less congestion), spatially spreading employment (and hence migrant inflows), etc.

In general, there is a strong bias toward property development, especially by Municipalities, because of the land leasing revenue that results, albeit a one-off effect (once land is sold, it enters the secondary market). This bias results in lower densities and more spread piecemeal development in metropolitan regions than would otherwise be the case, raising costs for transportation, civil, and environmental infrastructure, increasing energy demand, and imposing human time costs, e.g., long commutes. Because land lease revenues to local governments are one-off, within the next few decades most Municipalities will need to implement alternative local revenue generation systems, a property tax would be most efficient. However, it will be difficult for any one Municipality to take initial action in this regard because of competitiveness concerns. The national government will need to take the lead, mandating urban property taxes nationwide.

Fiscal inequities among local government units are cumulative over time, affecting not only physical development, but the ability of local governments to pay pensions, deliver social services, invest in catalytic infrastructure and facilities, which reinforces the differential attractiveness of sub-Municipal jurisdictions for investment, setting off a vicious circle of increased spatial inequity within the metropolitan region. A downward spiral can result, in which poorer local jurisdictions become even less attractive to investors, talent, etc., attracting even less investment.

2.2.4 Physical Planning

Physical planning at the metropolitan scale in China, although improving, would benefit from major reform. The underlying problems are: (i) Chinese metropolitan regions are changing too rapidly to be meaningfully guided by static master plans, which proscribe desired future physical outcomes, using traditional (often out-dated) techniques such as zoning. Approaches that combine strategic / structural planning with large site scale performance based planning,[135] are

[134] All but one of the former Counties in Shanghai have been converted to Urban Districts.

[135] Performance based planning is based on the assumption that master planning is obsolete in today's fast-changing, increasingly market driven world. Furthermore, in some cultures such as East Asia where mixed use on a given site is the norm, and desirable, zoning / master planning type approaches to urban planning, which are two dimensional and generally single function in orientation are of local value. In large, dense cities, such as those in East Asia, which are as much vertical as horizontal, two-dimensional (horizontal) zoning / master planning makes little sense. Lastly, conventional master planning is poorly suited to redevelopment of built-up urban areas where new development is combined with upgrading of existing resources, including heritage resources.

Performance based planning does not negate the need for overall strategic and structural frameworks which guide urban form / function for districts. However, it recognizes that proposals for development or redevelopment of areas of cities can not be predicted as they come from a myriad of private sector and highly pluralistic public sector institutional environments.

Generally, performance based planning is undertaken on a super-block or smaller scale. Performance based planning focuses on what counts, that is, the effect of a new development on the well-being of people, the environment, the

more appropriate to the Chinese metropolitan context. (ii) Physical plan preparation is by Bureaus of Planning (part of the Ministry of Construction hierarchy), who usually contract the work to Urban Design Institutes. The plans that the latter prepare generally reflect inadequate understanding of, and attention to, demographic and market forces, and limited understanding of local conditions (endowments) and preferences of the local population. Furthermore, the physical plans often do not reflect the largely predictable spatial impacts of major public investments by other public agencies. The planning process of the Municipality of Chengdu, during the 8-10th plan periods, reflects these shortcomings. Chengdu's Municipal Plan called for growth to the east of the city (which was rational from a planner's perspective – lower quality agricultural land, fewer archeological assets, more reliable water supplies, etc.), when in fact most growth occurred to the west, because of major public investments in the new Suangliu international airport (to the southwest), the high tech park (to the northwest in Pixian), and tourism links to the northwest (Dujiangyang).[136] The result was that metropolitan/physical development occurred in virtually the opposite direction from that advocated in the physical plan. (In the case of Chengdu this problem is now being corrected through market forces [high priced land to the west], and significant public investment to the east.)

Physical plans often do not reflect local citizen preferences, cultural and historical uniqueness, etc. As civil society develops more voice in urban planning processes in China, change is likely, possibly based on metropolitan wide civic groups, as has been the case in North America and the United Kingdom. As described in Chapter 1, such groups have played a very influential role in Chicago (dominated by business interests), New York (dominated by urban design and management professionals), Toronto (driven by the need to absorb immigrants productively, deliver affordable housing, and attract investment), and London (all of the foregoing). Equally important would be development of quality private sector urban planning firms in leading Chinese Municipalities to compete with the Urban Design Institutes and inject more innovative thinking into metropolitan planning in China. This would represent a logical progression based on previous reforms, in particular the fact that local design institutes lost direct state funding in 1983, leading to greater differentiation in product and quality.[137]

Shortcomings in metropolitan scale physical planning processes are exacerbated by the increasing lack of effectiveness (impact) of the hierarchical land quota system in shaping

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performance of the urban economy (including employment) and urban accessibility (transportation) performance. As such, performance based planning assesses a proposed development's major impacts (defined in a focused manner) against a notion of carrying capacity. Performance planning makes a decision on a project (including recommended modifications) based on assessment of environmental emissions (air, water, noise), traffic generated (focusing on peak hours), employment created (type, likely residence location of employees), social service impacts (e.g., required classrooms), etc.

[136] Schneider, A., Seto, K., Webster, D., Cai, J., and Luo, B., *Spatial and Temporal Patterns of Urban Dynamics in Chengdu 1975-2002*, Stanford: Stanford University, 2003, Monograph in the Urban Dynamics of East Asia Series, APARC. (Posted on www at: http://APARC.stanford.edu)

[137] For example, the China Architecture and Research Group (CAG) has evolved into an innovative architectural group, from its routes as a state-funded design institute. The same trend is not yet evident in terms of city planning despite the fact that it is now legal for private urban planning firms (national and international) to operate in China; but there is a lack of such firms, and local governments tend to keep using traditional urban design institutes, regardless of the quality of their work.
See: Lubow, A. " The China Syndrome" in, *New York Times Magazine*, May 21 2006

metropolitan regions. Through use of loopholes, e.g., “deurbanizing” less desirable land (often marginal, e.g., difficult terrain or remote) within a Municipality in exchange for prime urban land, net land quotas are effectively increased. Accordingly, land quotas are increasingly losing their leverage in influencing the rate and extent of physical build-up among local jurisdictions within metropolitan areas. The demise of effectiveness of land quotas is not necessarily a negative, provided land markets are working (i.e., primary markets are not under pricing land), and physical planning systems are improved, for example, to encourage high density metropolitan nodes and discourage spread of the built up city onto fertile lands.

Because metropolitan plans are often unrealistic, and outcomes on the ground diverge widely from what is proposed, the plans lose credibility, importantly, in the eyes of other government agencies (that make significant investment decisions), and private developers. More realistic plans would have much greater influence in shaping metropolitan regions, as both public agencies and private developers stand to benefit from more foreseeable future urban spatial development patterns.

Distortions in metropolitan spatial structure, especially in peri-urban areas and satellite towns are often locally justified by Ministry of Construction standards. Local officials use these standards to rationalize overly wide roads, expansive public squares, etc. The standards are often excessive for suburban and peri-urban development in metropolitan areas. When combined with unduly low land prices in many of these peripheral areas, the result is unnecessarily low densities, and communities that lack a human scale. A further problem is that County level planning is often poorly coordinated with neighboring jurisdictions, e.g., roads, water and waste water lines, that are not properly linked (in terms of network routing, capacity, etc.) at County boundaries.

Many Municipal physical plans lack a strategic sense, reflecting existing patterns of land use rather than bold new thinking. (There are notable exceptions, especially Shanghai, which is dramatically reshaping the city through key initiatives, e.g., development of Pudong, and preservation of the historic Bund, the Expo 2010 river front site.) Other metropolitan scale (Municipal) plans are bold, e.g., Kunming (the plan proposes a regional city consisting of several new cities around Lake Dianchi), but are based on idealized design concepts rather than being driven by economic (see next paragraph) and environmental realities.

Metropolitan physical plans in China should be based on a thorough understanding of the likely future economic role of the city. This requires an understanding of contemporary drivers, e.g., rise of knowledge industries, Just-In-Time manufacturing, fast-rising energy costs, the importance of face-to-face interaction in urban innovation, etc. In other words, form should follow function, not vice versa. Given current conditions, metropolitan plans need to identify urban centers (CBDs, suburban centers, peri-urban centers) that are clearly specialized in terms of function, as is the current practice in virtually all developed country metropolitan planning systems. These centers, in turn, need to be networked, e.g., by Light Rail Transit (LRT) or heavy rail links, plus super-arterial roads or expressways, joining urban centers, key infrastructure (airports, seaports), etc. Within each specialized node, high density development (but not congestion), and specialized economic clusters should be encouraged. Evidence from East Asia indicates that strong CBDs and a limited number of suburban centers should be encouraged in China, given the increased importance of face-to-face contact, enjoyment derived from high

density 24/7 environments, etc. However, care should be taken not to create too many urban centers, which will dilute activity too much and cause disinvestment in other areas, as has occurred in Qingdao, and internationally in metropolitan areas such as Manila.

At the megapolitan level, the prime issue, in terms of physical planning, is primarily a lack of legal constructs (including administrative guidelines) to give megapolitan plans legitimacy, and hence more influence. Chinese Municipalities, Provinces, and professional planners are developing approaches to megapolitan scale planning, the BTR plan being the best example to date.

Given the difficulties of coordinating extended urbanization across Municipal, Provincial, and in the case of the PRD, Special Administrative Region (SAR) boundaries, megapolitan coordination is only likely to work if it is focused on region-shaping strategic issues, e.g., regional scale infrastructure, settlement roles, and economic development. In sum, it should be strategic in nature, focus on functional / economic roles of urban centers, the routing of inter-urban corridors (served by expressways, HSR, etc.), designation of green corridors and wedges, and the location of major facilities such as airports and seaports.

2.2.5 Environmental Sustainability

Environmental sustainability is a major metropolitan issue. Environmental quality varies widely across metropolitan areas because of variance in land use, bio-physical conditions, traffic flows, etc.; but more importantly from a governance perspective, from differential investment and enforcement, because of major differences in the intensity of efforts (particularly enforcement) and spending to reduce pollution by local jurisdictions within metropolitan regions.

Counties, in particular, because of their greater autonomy within metropolitan systems, their concern with short-term economic growth (an important criterion by which local officials are judged), and the chasing of manufacturing for fiscal reasons, are often major sources of water and air pollution. The fact that Counties are responsible for provision of environmental infrastructure within their boundaries, but are often reluctant to spend substantially on environmental infrastructure, compounds the impact of the above factors. The problem may be exacerbated by the fact that high-level corporations (international and national), with more capital and knowledge to reduce emissions locate in high-level (often national level) ETDZs and High Technology and Science Parks, leaving County and Township level industrial zones to accommodate more marginal firms. This dynamic is clearly seen in Harbin. Given the lack of Edge Cities in China (with the partial exception of Beijing) with high levels of high end service activity (as in the United States), Counties and other jurisdictions on the edge of metropolitan areas often have little choice but to pursue manufacturing to develop an employment/economic base, to some extent, looking the other way in terms of pollution implications, especially when the highest quality firms have already been lured into national level ETDZs, etc. A double effect is present, (i) manufacturing, which has more environmental impact than service activities almost invariably locates on the edge of metropolitan areas (where it should be), and (ii) the most polluting firms often locate in the economically and institutionally weakest Counties.

The culture of governance at the County level often does not place a high value on environmental quality, being dominated by “growth at all costs” thinking. Given air and water

flows in metropolitan areas (and beyond), County sourced pollution often affects environmental quality in *City Propers* (Urban Districts), or in communities downstream or downwind. The fact that Environmental Protection Bureaus (EPBs) operate locally, although potentially a positive factor in that they are closer to the people, is often in reality negative, in that County level EPBs are subject to pressures from other local Bureaus and officials who, as noted, often value economic growth over environmental quality.

On the other hand, the movement of manufacturing from core cities to peri-urban areas has been a positive policy, successfully undertaken in most metropolitan areas in China. (In fact, China is regarded as a leader among countries in this regard.) Many firms have used land cost differential windfalls generated by the move to peri-urban areas to improve the environmental (and technical and financial) efficiency of production processes. However, this may be a one-off effect if County governments do not keep the pressure on for continued improvement in environment performance by manufacturing firms now that the relocation of manufacturing to peri-urban areas in metropolitan areas is substantially (perhaps 80%) complete.

Improving environmental quality in metropolitan areas, and particularly in Counties, will require squeezing local governments from both the bottom (civil society) and the top (environmentally progressive Municipalities). Unlike, Counties, many Municipalities in China have progressive track records in improving the quality of the environment, particularly Shanghai (where more than 3% of the Municipality's Gross Product is being spent on environmental improvement) and Chengdu where rivers have been cleaned up (2.7 Billion RMB have been invested in cleaning up the Fu and Nan Rivers, winning Chengdu a UNESCO award), 100% of taxis operate on Compressed Natural Gas (CNG), etc. Beijing and Chongqing, starting from extremely serious base line conditions, have made considerable progress in reducing air pollution. Because Municipalities are more concerned with the overall competitiveness of metropolitan areas, encompass land areas large enough to be subject to negative externalities from high pollution Counties within their boundaries, and are involved in strategic planning for the whole metropolitan area, they tend to invest a much higher percentage of their budgets in environmental improvement, and more seriously enforce environmental regulations. Another important factor differentiating Municipalities from Counties is that Municipalities monitor the environment closely, e.g., monitoring air pollution on a daily basis, and by preparing annual environmental status reports, whereas Counties do not (although they are required to do so). Last, but not least, Municipalities are associated with the national and international images (good or bad) of Chinese cities. Thus there is considerable incentive for officials to improve environmental quality, especially for key events such as the Olympics in Beijing and Qingdao (2008) and the World Expo in Shanghai (2010). Improvements in these metropolitan areas may (hopefully) set off amenity competition among Municipalities in China, especially as Chinese metropolitan areas increasingly recognize that amenity is one of the prime drivers of economic development, being pivotal in location decisions of leading corporations, as has been the case in North America for at least three decades.

Another issue affecting environmental quality is that Counties that deliver recreational and environmental services to the metropolitan area as a whole are not rewarded fiscally for delivering these functions. This is a particularly important issue, because given China's current level of economic development, and cultural factors, weekend and day tourism on the edge of the

metropolitan area is an important function and land use in peri-urban areas. As indicated in Chapter 1, there are global examples of fiscal transfers among jurisdictions within metropolitan regions to create or maintain green space for recreational and environmental uses. The Randstad Region is of particular interest in terms of support to environmental and recreational land use service functions, in that local land owners and local authorities are compensated through for keeping designated land in green uses. As noted, the case of the Han River in the Seoul extended urban region is another best practice, whereby upstream jurisdiction are subsidized to maintain clean water flows through the metropolitan area.

2.2.6 Economic Development

As has been argued, fiscal incentives, and past development thinking/policies that favored heavy industry, often resulted in local governments favoring manufacturing. Service activities, particularly amenity activities (tourism, MICE,[138] retirees, amenity migrants), are often not valued highly enough by local governments, and thus are less likely to be subsidized through low land costs, etc. This situation is especially serious when pro-manufacturing policies are pursued in metropolitan regions such as Kunming that do not possess comparative advantage in manufacturing, but do for amenity. The bias toward manufacturing is seen in local government staffing. Bureaus associated with manufacturing have higher status, more and higher level personnel, etc., than those associated with activities such as tourism or business and professional services, even though the latter activities may contribute more to the local economy, and/or have more local developmental potential.

Many metropolitan areas mix incompatible land uses within short distances of each other, e.g., Dujiangyan in the Chengdu metropolitan area, Haikou in Hainan, Kunming. Not playing to comparative advantage is a problem at the metropolitan wide level, but is often magnified at the County or Urban District level. For example, a Municipality may have a policy to attract high end professional and business services (such as Chengdu) or tourists (such as Kunming or Xiamen), but areas where tourists visit (often Counties) may be polluted or visually degraded (e.g., sight lines from Xiamen's beaches) by incompatible activities.

There is a need to undertake more sophisticated strategic assessment and planning at the metropolitan (Municipal) scale. Progress is being made on this front, facilitated by initiatives such as the Cities Alliance City Development Strategies program in China.

Once strategies have been formulated for the metropolitan area, based on a limited number of strategic thrusts, sub-Municipal governments need to cooperate. As noted, this is often easier in the West than in coastal areas, but administratively, Municipalities do have the power to guide lower level jurisdictions in terms of economic development priorities. Again, the legitimacy of metropolitan economic development strategies, that is, the ability to obtain cooperation from sub-Municipal jurisdictions, will largely depend on the quality, vision, and realism, of economic development strategies developed by Municipalities. New approaches to economic development planning are needed in Chinese metropolitan regions, e.g., economic assessment based on cluster analysis, not on sectors. Economic development planning is often poorly done, based on symbols, e.g., "3 pillars, 2 corridors, 4 belts", than deep analysis; and frequently indicates a

[138] Meetings, Incentive Travel, Conventions, Exhibitions

"cookie cutter" approach mimicking strategies elsewhere in the country that may not be appropriate to the metropolitan system in question.

Of concern is the spatial distribution of economic activities in many metropolitan areas. Even Townships and Villages build industrial development zones, offering inexpensive land to attract firms. Such activity may result in higher transport costs, higher consumption of energy, nuisance and pollution effects on those living nearby, and less efficient labor markets. From a metropolitan (and national) economic perspective, subsidizing low-end manufacturing locally may discourage movement of the metropolitan economy up the value chain.

2.2.7 Urban Expansion

The farmland reserve system in China works reasonably well, discouraging expansion onto Class 1 agricultural land. However, there are numerous cases of County officials failing to enforce the policy, allowing "farmers' villas", etc., to be built on Class 1 agricultural land, effectively urbanizing high fertility agricultural land. (Given that only 7% of China's land is arable, this is a serious issue.) To a considerable degree, the problem can be addressed by enforcing existing laws and regulations. At a more sophisticated level, approaches such as land readjustment in peri-urban areas would enable farmers to own villas while minimizing loss of high fertility agricultural land, by clustering such development at medium densities, preferably on lower fertility land.

A major concern in terms of the physical expansion of metropolitan areas is that key arterial and feeder infrastructure often follows, rather than leading, physical development on the periphery. (The exception is expressway infrastructure, often part of inter-urban systems, which is frequently in place, driving development, even if piecemeal, in certain directions.) This condition, combined with small plot development, often results in particularly low quality development on the edge of metropolitan areas, areas that soon become incorporated into the metropolitan fabric, and will be difficult to redevelop (retrofit), including densification, at a later date. A further problem is that some Counties may build good local infrastructure away from edge of the built up area, encouraging leap-frogging of physical development past less proactive jurisdictions. Where possible, development should occur sequentially outwards from a significant suburban or peri-urban center, or from the edge of the built up area, along corridors, nucleated around nodes with direct access to rail and expressway systems.

Metropolitan physical expansion needs to be structured. As noted above, the dominant principle should be to create nodes (urban centers) along corridors (termed "necklace" development) to enable energy efficient and human time saving corridors to be viable.

Release of land at very low cost, especially for manufacturing, by local governments, distorts market forces that would encourage higher densities of sites on the edge of metropolitan areas through higher land prices – a desirable phenomenon that is being seen in many global metropolitan areas, e.g., Bangkok, Los Angeles, Phoenix. In these cities, developments on the edge are often of higher density than those in inner suburban locations, driven by efficient land markets.

Given that metropolitan peripheries have been driven out so far by leap-frogging development in China (especially between 1990 and 2000), there is significant potential for in-filling within current metropolitan perimeters, as is clearly indicated by remote sensed analysis.[139] Increased infilling in Chinese metropolitan areas would save valuable farmland and land for recreational and environmental uses on the edge of urban systems, would improve the efficiency of labor markets and economic clusters, and would reduce growth in energy consumption associated with metropolitan development. For example, much of the physical growth in Guangzhou over the last decade has occurred through in-filling (as discussed above), and time series spatial imagery indicates considerable infilling over the last decade in the case of Chengdu. Property taxes would encourage in-filling, as would increased enforcement of the build within two years after a land sale national requirement. The latter regulation is starting to being enforced in some jurisdictions, perhaps accounting for the increased in-filling seen in some Chinese metropolitan areas over the last few years.

Urban redevelopment of core areas in Chinese cities is becoming increasingly difficult as local (neighborhood) groups become more organized and demand higher compensation for land/buildings. In fact, in many cities such as Xi'an, large-scale urban redevelopment by the private sector is no longer financially viable. Given this situation, infilling back from over extended metropolitan perimeters offers an easier route to create interesting neighborhoods, innovative districts, etc., although large scale urban redevelopment will still be needed in specific cases, e.g., redevelopment and historical restoration of the area within Xi'an's historical wall.

2.3 Policy Implications

The policy implications of the foregoing assessment of key issue areas are summarized below:

2.3.1 Metropolitan Governance Structure

In general, the structure of metropolitan Government in China is suitable for effective metropolitan governance. With a few exceptions, such as Shenzhen Municipality (which is only 2000 square kilometers in size), Municipalities in China are more than large enough to physically accommodate all forecast physical and demographic growth until 2050, after which Chinese urbanization will slow dramatically. The existing array of Bureaus (horizontal structure) and local jurisdictions (Urban Districts, Counties, etc.) is not overly fragmented by international standards. The key issue is how to make the existing structure work more effectively by changing the incentive system facing key stakeholders, public and private, as they build communities, create jobs, invest in infrastructure, etc.

In a few cases, Municipal boundaries could be beneficially enlarged (which may be politically difficult) to include key source areas of resources serving the metropolitan region, e.g. water supplies,[140] or to respond to a vector of urban development that has progressed beyond the boundaries of the Municipality, e.g., along a major inter-urban corridor, e.g., Guangzhou.

In almost all cases, as metropolitan expansion occurs, more rapid conversion of Counties into Urban Districts would be beneficial, enabling better coordination of metropolitan development

[139] See Schneider, A. (2003), and Angel, S., Sheppard, S., and Civco, D., *The Dynamics of Global Urban Expansion*, Washington: World Bank, 2005

[140] As Beijing Municipality did in 1958, currently 16,800 square kilometers in size.

by Municipal governments. Ideally, this upgrading of status should occur before widespread urbanization occurs within the County in question, enabling infrastructure led development.

2.3.2 Re-allocation of Functions & Horizontal Coordination

A key to improved metropolitan governance is vertical re-allocation of functions. As argued above, Urban Districts and Counties should be given more responsibility for delivery of social services while Municipalities should be more involved in strategic planning, metropolitan-scale network infrastructure planning and delivery, etc.

Re-allocation of functions would result in economies of scale and improved metropolitan functioning, by delivering services at the most effective geographic scale. Removing all overlap in mandated functions is not always the best policy (it reduces inter-jurisdictional competition), but as a general rule, specific functions should be mandated to specific vertical levels, with minimal overlap and confusion, a situation that does not yet exist in Chinese metropolitan regions. There is a need for the national government to take the lead in this regard.

Equally important is improved horizontal co-ordination among local governments within Municipalities. There are several means to do this if strong Municipal Government led metropolitan co-ordination is not possible, e.g., (i) Councils of Local Government (CLG), (ii) Regional Districts – which can gradually add functions over time, such as the Greater Vancouver Regional District, (iii) bilateral and multilateral contracting among local governments, possibly encouraged through matching grants from Municipalities or more senior governments, and (iv) Public – Private metropolitan scale organizations such as the Greater Phoenix Economic Development Council (GPEC), the Greater Toronto Marketing Alliance (GTMA), or the Chicago Metropolis 2020 (all discussed in Chapter 1).

Within local jurisdictions, there is need for much better cross-agency cooperation e.g., in installing or maintaining infrastructure along (under) corridors. In Chinese urban areas, roads are constantly dug up to install new infrastructure, with virtually no cooperation among bureaus and agencies; improved coordination would reduce costs, construction induced delays and impacts, etc.

2.3.3 Metropolitan Taxation & Fiscal Reform

Fiscal systems in metropolitan areas will need to change dramatically over the next decade. In some cases this will be inevitable, e.g., resulting from declines in land lease revenues as less land becomes available to local governments to lease. Fiscal systems should be more neutral in terms of types of economic activity, not biasing local jurisdictions toward chasing particular types of economic activity and land use, such as manufacturing, for revenue reasons.

Major reform is needed to eliminate “off budget” transactions, thereby making overall local government budgets transparent, which will enable much more rational allocation of public resources within metropolitan areas. There are initial moves in this direction in that many Municipalities, e.g., Xi’an, now immediately post all primary market land transactions (sales by Government) on the internet, significantly improving the transparency and efficiency of metropolitan land markets. Such transparency could be extended to all fiscal information, in regard to both revenues and expenditures.

As argued, introduction of a property tax in China's metropolitan areas would address many of the fiscal issues discussed, e.g., sustainable revenue generation, elimination of off-budget transactions, and neutral economic activity incentives.

Given the importance of in-filling, and denser development on the edge of built up areas, the build within two years (after land lease sales by government) requirement should be enforced.

Tax sharing between Municipal and sub-Municipal governments should be assessed in each Municipality (facilitated by development of new national guidelines), then structures and processes need to be put in place to expedite such transfers within Municipalities. As indicated in Chapter 1, there is precedent for such transfers in metropolitan areas such as Minneapolis – St Paul (US) and the Tokyo Metropolitan Government. For example, as has been argued, local jurisdictions, particularly Counties, offering significant environmental and recreational services should be compensated through fiscal transfers, from the Municipal Government, that generates revenues from richer jurisdictions. Otherwise, a perverse incentive exists to not offer land uses that are needed for the public good in metropolitan areas, but do not generate substantial fiscal revenue. The ultimate outcome, if transfers are not instituted, is that the metropolis will not offer enough spatial specialization; functions will be overly duplicated among local jurisdictions, an undesirable outcome in economic, environmental, and quality of life terms.

If social service delivery is to be decentralized within metropolitan areas, a policy currently being pursued by the Tokyo Metropolitan Government (see Chapter 1), significant transfers from Municipal Governments (and possibly other senior governments) will be needed.

We have argued for infrastructure led development, to more effectively shape metropolitan regions in China. This will require large-scale lumpy investment, but investment that will yield returns for a century or more in many cases, e.g., sewer systems, rapid transit, expressways. New forms of innovative finance are needed, particularly issuance of Municipal bonds, as in the United States, either directly by Municipalities (by the most established jurisdictions such as Shanghai) or through on lending by the national government (to smaller and lower profile Municipalities). Consideration could be given to personal (or corporate) income tax deductions to purchasers of bonds destined for local government use, as in the United States.

In the past, Municipalities (and other levels of government, e.g., Provinces, Counties) have relied too much on often ill-considered granting of concessions. The result often hinders efficiency of metropolitan systems. For example, in many metropolitan and megapolitan regions in China, tolls along certain routes (involving several concessions) are too expensive; expressway and road networks are often distorted in terms of route alignments by incremental granting of concessions.[141]

As a general principle, Municipalities need full knowledge of budgets of lower level governments, otherwise allocation of public resources, including transfers, will be sub-optimal. This will require large scale improvement in financial information systems, and transparency.

[141] Creating a situation whereby it is almost invariably less expensive to fly between Chinese metropoli, than drive.

2.3.4 Establishment of Multi-Stakeholder Metropolitan Governance

As has been argued, the prime difference in metropolitan governance between China and developed countries is in the area of civil society and multi-stakeholder involvement in governance. Although civil society involvement in metropolitan governance has generated negative outcomes in some cases, e.g., NIMBY effects in Manila in siting of landfills, etc., increased civil society involvement in metropolitan governance typically results in better outcomes, as indicated by the experience of developed countries.

As described in Chapter 1, many metropolitan areas in developed countries have well established public-private bodies that play a key role, sometimes a dominant one, in metropolitan governance. For example, in Chicago, the Chicago Metropolis 2020 civic society group, led by well respected local business men has been highly influential in Chicago's recent economic, demographic, and physical turnaround (the Chicago metropolitan area recently reversed its demographic decline).

In other metropolitan contexts, metropolitan wide civil society bodies take the lead in coordinating social functions and engaging specialized civil society groups in the life of the metropolis. An excellent example in this regard is the London Civic Forum (LCF). (See Chapter 1 for more details.)

In our opinion, in the case of China, private-public metropolitan-wide advisory bodies should be established driven by local industry associations, universities, and professional city builders (planners, architects, designers, etc.) Over time, more socially oriented interest group metropolitan wide bodies could be incorporated into metropolitan governance, e.g., labor, environment, over time. Accordingly, we view the Chicago and New York models as particularly relevant in terms of improving Chinese metropolitan governance in the short run.

2.3.5 China currently has four Provincial Level Municipalities:

Beijing, Shanghai, Tianjin, and Chongqing. Given the increased importance of metropolitan regions, we suggest that many additional metropolitan areas be accorded this status over time. Provincial level status cuts out a layer of the bureaucracy, enabling Municipalities to access national knowledge and fiscal resources more readily, and obtain faster decision making from the national government. Metropolitan areas that should, in the near future, be considered for provincial level status would include: Qingdao, Dalian, Ningbo, and Xiamen.

2.3.6 Megapolitan Scale Co-ordination

China has three well-established Megapolitan Regions (PRD, LYD, Beijing – Tianjin – Binhai New Area; and at least nine new or emerging ones. Because all Chinese megapolitan systems extend beyond one Municipality's boundaries, and often the Municipalities containing metropolitan systems within the megapolitan Region are not contiguous, co-ordination needs to involve Provincial Governments plus the metropolitan Municipalities. It is suggested that Megapolitan Committees be formed to discuss, and agree on, infrastructure and economic development roles (for Municipal / Prefecture jurisdictions within the megapolitan System) that lead to best megapolitan performance. The Megapolitan Committees would develop strategic / structural / settlement system plans for the Megapolitan Region in question, which would be approved by the Provinces (or national government) in question. Actual implementation would

be the responsibility of the Municipal or Provincial governments involved, based on normal defined functional mandates. Frequently, this will involve development of Corridor infrastructure connecting nodes, agreement on economic roles of Municipalities within the system - playing to their comparative and competitive advantages within the megapolitan region, siting of strategic region-shaping facilities, etc.

As noted, to a significant extent, the above systems only require formalization, through national level administrative guidelines, and Provincial implementation.

The sixteen Municipalities in the Lower Yangtze Delta Region already meet once or twice per year to coordinate development.[142] This includes regular meetings of the 16 mayors and regular meetings on economic cooperation organized by the policy advisory bodies of each Municipality. In addition, there are similar regular meetings involving functional issues, e.g. involving Agriculture Banks, Women's Federations, and Transportation Agencies.[143] The LYDR council of government has had mixed success to date. On the negative side, Shanghai continues to hold onto manufacturing that might be better located in smaller centers of the LYRD. On the other hand, progress is being made in terms of eliminating *hukou* (local registration) barriers to living/working within the Region, and rationalization of telephone tariffs in the Region that could reduce tolls between nearby places.

As noted, the Beijing – Tianjing – Binhai New Area, plus part of Hebei Province, has developed a structural plan for development of that Megapolitan Region.[144] Mechanisms need to be put in place to give legitimacy to such plans, and establish levers to enable implementation of key strategies, best implemented or co-ordinated at the megapolitan scale. In this regard, the Randstad model may have considerable relevance.

2.3.7 County Level Environmental Improvement

As noted, Counties generally have particularly poor environmental records within metropolitan areas, resulting in the lowering of environmental quality within metropolitan areas as a whole. The best way to address the problem is to: (i) make environmental monitoring a requirement at the County level, (ii) enforce environmental laws and standards, based on monitoring; a measure that will require local Environmental Bureaus to be at "arms length" from other Bureaus of the local Government (or have the enforcement done at the Municipal Level), (iii) provide Counties that wish to improve environmental conditions with fiscal transfers, matching grants, etc., (from senior governments), based on actual performance. Chongming Island in Shanghai Municipality is an example of successful use of such practice. The Municipality effectively compensates Chongming County to play an ecological function, maintaining a small population, acting as the lungs and recreational field for the highly urbanized Shanghai Municipality, and now, acting as the site of China's first model sustainable city. In Chongming, the Shanghai Government has

[142] Shanghai; 8 from Jiangsu Province: Nanjing, Suzhou, Yangzhou, Zhenjiang, Taizhou, Wuxi, Changzhou, Nantong;7 from Zhejiang Province: Hangzhou, Ningbo, Shaoxing, Huzhou, Jiaxing, Zhouzhan, Taizhou.
[143] *Economic Daily*, June 27, 2005
[144] "China's Next Building Site, Building the Nation; Planning a Rival for Shenzhen and Shanghai", *The Economist*, June 24 2006

begun construction of an "eco-city" named Dongtan, designed to be a showpiece sustainable city of 20,000 residents by the time of the 2010 Shanghai Expo.[145]

2.3.8 Infrastructure Led Metropolitan Development

Regardless of the extent to which physical planning, land quotas, etc., are utilized, infrastructure remains, and will remain, the main shaper of metropolitan form in China, as in most of the world. Thus to the extent that infrastructure can be put in place before large-scale development occur in peri-urban areas, metropolitan systems can be more effectively shaped. This requires both structure planning at the metropolitan, and megapolitan (where relevant) scales; and financial instruments to enable large scale infrastructure development, ahead of demand. There are many examples, globally, of best practice in this area, including by the World Bank. As noted, the largest metropolitan regions could issue bonds directly, while smaller systems should be served by on-lending. Currently the China Development Bank is playing a major role in lending to support infrastructure development in Chinese metropolitan regions, accordingly, it is well-placed to take a lead in the development of more sophisticated instruments to support Municipal development in China, including bond issuance, development of Municipal credit rating systems, etc.[146]

2.3.9 Peri-Urban Development

If metropolitan development in China is to be energy efficient, sustainable, and conducive to economic cluster development and innovation, peri-urban development needs to be relatively dense, and concentrated in nodes (urban sub-centers). Unfortunately, urban planning standards in China (by the Ministry of Construction) often work against such outcomes. Standards are used (sometimes as an excuse) by local governments, particularly Counties, County Level Cities, etc., to build infrastructure, roads, etc., that are beyond needed capacity, encouraging spread development. China should review these national standards; and more importantly, decentralize setting of many of these standards to the Municipal scale. The overall density guideline of the Ministry of Construction (each square kilometer of urban land should accommodate 10,000 persons – a standard that enables each household to have at least 100 square meters of space under normal Floor Area Ratios) is reasonable, but is often not achieved.

A major problem, typified by metropolitan development in Zengzhou Municipality, is that land is sold too inexpensively, particularly industrial land (which is often not subject to open bidding), in an overly aggressive attempt to induce manufacturing to locate. Under these conditions, it is not surprising that County Level Cities and other County settlements sprawl and are inefficient. Private enterprises almost invariably lease more land than they need, given that it is under priced. The solution is simple; follow the Hong Kong model of limiting the supply of new land on the primary market, resulting in higher prices. Additionally, the two years to build regulation should be enforced. A further measure would be to more strictly caveat the land use / development that can legally be undertaken on newly leased land, as in Hong Kong.

Metropolitan areas in China should consider implementing physical growth boundaries that would limit urbanization to areas within *urban* zones. New feeder infrastructure would not be built outside the growth boundaries. Such boundaries could surround patches as well as the core

[145] Dyer, G., "China to Pioneer First Sustainable City", *The Economist*, September 15, 2006, pg 2
[146] Yuan, Chen, Development Financing in China, *Urban Land*, October 2005, pp 32-36

built up area, expanding in directions that would result in increased contiguity of urban form, i.e., encouraging in-filling back toward the built up area. The growth boundaries could be adjusted when needed (every five years) so as not to overly constrain land supply, which can lead to higher priced housing, etc. Such an approach has been successfully employed in many metropolitan jurisdictions in the United States (Portland), Germany, Vancouver, etc.

Urban redevelopment is becoming increasingly difficult in China because land acquisition by local governments and private developers in built-up areas is becoming more difficult. In general, this is a reflection of a positive trend, namely growth of civil society in existing neighborhoods. However, for the public good, urban redevelopment is urgently needed in some run-down urban cores, Xi'an, within the walled city, is a good example. Related, land acquisition needs to occur to densify built-up areas within metropolitan areas, including provision of density-supporting infrastructure, such as rail transit lines. Since private developers cannot make a profit undertaking redevelopment in many built up urban areas, given the cost of buying property and resettling residents, new win-win approaches need to be introduced. In particular land readjustment approaches whereby existing residents share in the financial benefits of redevelopment (as well as having the option of obtaining a housing unit in the redeveloped area as part of their return) should be tried. Land readjustment was very successfully employed in Japan in the post World War II period, leading to very successful implementation of a rail station based metropolitan structure, particularly in the Tokyo Metropolitan region.[147]

Key locational magnets such as schools (particularly high quality middle schools), hospitals, and neighborhood parks, can be used to shape metropolitan form, effectively leveraging land and housing market forces.

Land readjustment also has considerable potential to shape urban form on the built up periphery in metropolitan areas. One of the key problems of peripheral development in China is that it is patchy, based on relatively small site development. Land readjustment on the periphery allows land to be pooled, enabling high quality peripheral development that can be more readily absorbed into the metropolitan structure on a sustainable basis. Good practice in this regard is occurring outside Beijing, particularly to the north. In the Beijing case, it is usually the Township or village level of government that takes the lead in instigating such processes, which County level governments encourage, and approve when such initiatives are deemed beneficial.

2.4 Conclusions

Metropolitan systems pack a punch far beyond their demographic weight in China, and will become increasing important in this Century. China is well placed to improve metropolitan governance, given the existence of powerful Municipalities, at least in legal and administrative terms. Municipalities should increasingly use these powers to act as true metropolitan co-ordination agencies. However, allocation of functions and incentive structures, related to fiscal systems, physical planning, environmental improvement, social service delivery, and economic development, to agencies operating within these Municipalities are far from ideal, requiring reform. International experience provides a wealth of knowledge on metropolitan governance

[147] For an overview of land readjustment approaches, see: Sorensen, Andre, *Land Readjustment and Metropolitan Growth: An Examination of Suburban Land Development and Urban Sprawl in the Tokyo Metropolitan Area*, Elsevier Science, Progress in Planning 53, 2000

practices that have worked elsewhere, although ultimately China will have to develop its own model, or more likely customized models relevant to different regions of the country. At the megapolitan scale, action needs to be taken to legalize promising early efforts which would enable strategic co-operation among Provinces and Municipalities to co-ordinate strategic level infrastructure, and economic and settlement system roles.

Annex 6: Presentations

1. Formulating City Development Strategies in China: Methodological Steps
Douglas Webster - Consulting Professor, Asia Pacific Research Center, Stanford University

2. Collaborative Regional Strategy and the Ha-Da-Qi Corridor Framework, Process and Cases
James Gollub - Senior Vice President, Global Economic Development, ICF International

3. Insights from International Metropolitan Governance and Implications for China's Practices
Cai Jianming & Douglas Webster
Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences
Arizona State University, USA

4. Ha-Da-Qi Corridor: A New Future
Cai Jianming
Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences
Arizona State University, USA

5. "Economic Revitalization by Cities in Heilongjiang Province"
A City Development Strategy (CDS) Program in Heilongjiang supported by Cities Alliance
Mats Andersson
Senior Urban Management Specialist, East Asia Urban Development Unit, The World Bank

6. How to create advantages for Harbin and the Ha-Da-Qi Corridor? Examples from other city-regions
Prof. Jan Annerstedt
www.cbs.dk
www.interlace-invent.com