

COMPENDIUM OF GOOD PRACTICES

Urban Transportation
in Indian Cities





URBAN TRANSPORT
MANAGEMENT

TECHNOLOGY IN
TRANSPORT

INCLUSIVE TRANSPORT

GREEN LOW CARBON
TRANSPORT

COMMUNITY
ENGAGEMENT

LAND-USE &
TRANSPORT
INTEGRATION



an initiative of



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Urban Transportation in Indian Cities



National Institute of Urban Affairs

Prepared by



ICRA Management Consulting Service Limited

PREFACE

The National Institute of Urban Affairs is the National Coordinator for the PEARL Initiative (Peer Experience and Reflective Learning). The PEARL program ensures capacity building through cross learning and effective sharing of knowledge related to planning, implementation, governance and sustainability of urban reforms and infrastructure projects – amongst cities that were supported under the JNNURM scheme.

The PEARL initiative provides a platform for deliberation and knowledge exchange for Indian cities and towns as well as professionals working in the urban domain. Sharing of good practices is one of the most important means of knowledge exchange and numerous innovative projects are available for reference on the PEARL website. “Knowledge Support for PEARL” is a program supported by Cities Alliance that aims to qualitatively advance this initiative. One of its key components is to carry out a thematic and detailed documentation of good practices in various thematic areas related to planning, governance and service delivery.

In an effort to fill the critical knowledge gaps for efficient service delivery in Indian cities, a number of exemplary good practices from cities across the country have been compiled into five thematic volumes. Each volume addresses a specific issue such as water supply & sanitation, urban transportation, solid waste management, cultural heritage and urban reforms. Cases are examined from the perspective of increasing operational efficiency, enhancing systemic capacity, the creation of efficient public private partnerships and building long-term sustainability.

The present volume focuses on the theme of ‘Urban Transportation’ (UT) to cover practices, projects and innovations in improving the quality, efficiency and sustainability of urban transportation in Indian cities. It also strives to study examples of people’s participation in these projects for overall enhancement of inclusive and sustainable planning. The documentation illustrates examples of technology assisted traffic management; promotion of non-motorized transport; user-friendly and accessible transport; green low carbon transport; alternative mobility solutions and pedestrianisation - highlighting factors of successful implementation, replicability, financial sustainability and contextual nuances.

We hope that this volume can become a useful resource for the practitioners and officials who will provide momentum to the project of improved urban transportation in India.

Jagan Shah
January 2015

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The compendium of good practices titled “Urban Transportation in Indian Cities” is an outcome of a collective contribution of several individuals as well as institutions. NIUA would like to acknowledge their contribution to the extent possible.

Firstly, we wish to sincerely thank the Cities Alliance and World Bank whose grant support and knowledge partnership for PEARL has made the documentation possible at a time when urban transportation is one of the main agendas of the Government of India.

We would like to thank ICRA Management Consulting Services Limited (IMaCS) for undertaking this documentation and their team comprising of Kinshuk Pal, Niyati Tandon, Dipen Nathwani and Pawan Dwivedi who have completed this activity successfully. NIUA acknowledges their valuable contribution.

We are grateful to all the Peer Review Group members Himani Jain, Chirayu Bhatt and Amit Bhatt, whose valuable inputs through the entire duration of the documentation have only enriched its content.

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The report would not have been complete without the coordination and editorial support of the PEARL Team comprising of Shabana Charaniya, A. Nanda Kishore, Yogita Lokhande, Siddharth Pandit, Shilpi Madnawat, Shoma Mathew, Sridipta Ghatak; and Deep Pahwa and Kavita Rawat for designing and formatting the compendium.

Finally, a special thanks to Ajay Suri, Regional Adviser-Asia, Cities Alliance and Prof. Jagan Shah, Director NIUA for their support, guidance and inputs. We have all been enriched by the experiences gained in this process and sincerely hope that the report will contribute towards strengthening urban transportation services in India in cities.

Dr. Debjani Ghosh
Project Coordinator

LIST OF ABBREVIATIONS

ABLA	Ashok B. Lall Architects	MLA	Member of Legislative Assembly
AFC	Automatic Fare Collection	MMR	Mumbai Metropolitan Region
AGLR	Andheri-Ghatkopar Link Road	MMRDA	Mumbai Metropolitan Region Development Authority
AMC	Ahmedabad Municipal Corporation	MoUD	Ministry of Urban Development
APP	Application	MPKm	Mileage Per Kilometre
ATC	Area Traffic Control	MRTS	Mass Rapid Transit System
AUDA	Ahmedabad Urban Development Authority	MRVC	Mumbai Railway Vikas Corporation
BMTC	Bangalore Metropolitan Transport Corporation	MTNL	Mahanagar Telephone Nigam Limited
BQS	Bus Queue Shelter	MUTP	Mumbai Urban Transport Project
BRTS	Bus Rapid Transit System	MUZ	Multi Utility Zone
BSNL	Bharat Sanchar Nigam Limited	NCR	National Capital Region
CBD	Central Business District	NDMC	New Delhi Municipal Corporation
CCTV	Closed Circuit Television	NEKRTC	North Eastern Karnataka Road Transport Corporation
CEPT	Centre for Environment Planning and Technology	NGO	Non Government Organization
CNG	Compressed Natural Gas	NH	National Highway
CTTP	Comprehensive Traffic and Transport Plan	NIP	Neighbourhood Improvement Plan
CUG	Close User Group	NIUA	National Institute of Urban Affairs
DDA	Delhi Development Authority	NMT	Non Motorised Transport
DIMTS	Delhi Integrated Multimodal Transit Systems	NUTP	National Urban Transport Policy
DMRC	Delhi Metro Rail Corporation	NWKRTC	North Western Karnataka Road Transport Corporation
DPR	Detailed Project Report	OD	Origin- Destination
DRI	Differential Rate of Interest	ODI	Oasis Design Incorporated
DTC	Delhi Transport Corporation	PCIC	Pimpri Chinchwad Infrastructure Corporation
DULT	Directorate of Urban Land Transport	PCMC	Pimpri Chinchwad Municipal Corporation
EIRR	Economic Internal rate of return	PNB	Punjab National Bank
EMI	Equated Month Instalment	PPP	Public Private Partnership
EPKm	Earnings per Kilometre	PT	Public Transport
FATC	Fully Adaptive Traffic Control	PT	Public Transportation
FIRR	Financial Internal Rate of Return	PwD	Person with Disabilities
FM	Frequency Modulation	PWD	Public Works Department
FMCG	Fast Moving Consumer Goods	RATS	Refusal, Accessibility, Transparency and Safety
FSI	Floor Space Index	RBI	Reserve Bank of India
GHG	Green House Gases	RoB	Road Over Bridge
GMLR	Goregaon-Mulund Link	RoW	Right of Way
GoI	Government of India	RSI	Road Safety Index
Govt.	Government	RSRTC	Rajasthan State Road Transport Corporation
GPS	Global Positioning System	RTO	Road Transport Organization
GTPUDA	Gujarat Town Planning and Urban Development Act	RTV	Rural Transport Vehicles
GUI	Graphics User Interface	RWA	Residents Welfare Association
HDPE	High Density Polyethylene	SC	Scheduled Castes
HSD	High Speed Diesel	SCLR	Santacruz-Chembur Link Road
HUDA	Haryana Urban Development Authority	SDMC	South Delhi Municipal Corporation
IIT-D	Indian Institute of Technology- Delhi	SGA	Sandeep Gandhi Architects
IMaCS	ICRA Management Consulting Services	SMS	Short Message Service
IPT	Intermediate Public Transport	SPA	School of Planning and Architecture
ITACA	Intelligent Traffic Adaptive Control Area	ST	Scheduled Tribes
iTrans	Innovative Transport Solutions	TDR	Transfer Development Rights
ITS	Intelligent Transport Systems	TOD	Transit Oriented Development
JnNURM	Jawaharlal Nehru National Urban Renewal Mission	TTI	Travel Time Index
JVLR	Jogeshwari-Vikhroli Link Road	UIT	Urban Improvement Trust
KRDC	Karnataka Road Development Corporation	ULB	Urban Local Body
KSRTC	Karnataka State Road Transport Corporation	UNCRPD	United Nations Convention on Rights of Persons with Disabilities
LED	Light Emitting Diode	UTF	Urban Transport Fund
LFB	Low Floor Buses	UTTIPEC	Unified Traffic And Transportation Infrastructure [Planning & Engineering] Centre
LIC	Life Insurance Corporation	VAT	Value Added Tax
MCD	Municipal Corporation of Delhi		
MCGM	Municipal Corporation of Greater Mumbai		



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EXECUTIVE SUMMARY

The present documentation summarizes thirteen (six detailed and seven snapshots) initiatives, selected from different Indian cities to improve the service delivery of urban transport. These projects have been segregated into six categories namely, Urban Transport Management, Technology in Transport, Inclusive Transport, Green Low-Carbon Transport, Community Engagement and Land-use Transport Integration. Each category comprise of one detailed documented project and one project as snapshot. For each, the study documents description of the project including brief introduction about the initiative, factors of success, budgetary implications, performance and impact of the project. Besides, it also identifies challenges/ constraints and lessons learnt.

Recognizing the potential as well as need for **urban transport management**, number of Indian cities have come up with innovative measures to improve the efficiency of their transport systems. Urban Transport Services for Medium and Small Size Cities of Karnataka has been included in this section as the detailed documented project. Implementation of this initiative indicates that public transport systems can also be practical and viable in small and medium cities. The project also claims increase in ridership, journey speed, revenue collection and reduction in greenhouse gas (GHG) emissions. In the same category, efforts undertaken by Nirmal Foundation in streamlining auto-rickshaw services in different cities of Gujarat has been captured in snapshot form.

Intelligent management of traffic flows and making commuters more informed about traffic and road status, can reduce the negative impact of congestion, though cannot solve it altogether. This is the essence behind the whole concept of introduction of **Intelligent Transport Systems**. Mumbai Area Traffic Control is one such project wherein the application of ITS has resulted in maximizing traffic flow, reduced congestion and reduction in junction stops and delays to suit traffic conditions at different times of the day. Another such project worth emulating is the Bangalore Traffic Improvement Project (BTRAC). The project quantifies the reduction in travel time, improvement in travel speed, reduction in accidents, better enforcement action plan, and paperless enforcement of motor vehicles act for the first time in the country.

The availability of transport services for the poor, women, persons with disability and the elderly has emerged as an important issue in the context of a number of transport policies with change in focus to equitable distribution of resources and facilities. Inclusive Transport forms the next category of documentation. Alwar Vahini is one such programme which not only

provides systematic urban transport services but also takes care of the operators as well. Initiatives undertaken by Samarthyam Foundation has been included as snapshot under this category. By undertaking comprehensive audits of exiting transport infrastructural services, this agency has propagated design interventions in favor of the disabled and vulnerable users.

Growing GHG emissions from the transport sector is inextricably linked to an overall lack of sustainability expressed by poor urban planning, increased motorization, increased air pollution and noise, growing congestion and decreasing road safety. Many initiatives are already under implementation to lower the rate of GHG emissions. Keeping the importance of such initiatives, **Green-low carbon transport** has been included as next category. Introduction of “dial-a-rickshaw” service by Graduates Welfare Association Fazilka is one unique concept. This scheme provides on-call facility wherein the caller gets an eco-friendly cycle rickshaw at his/her doorstep. The project has been detailed out in this section followed by provisions made by Nanded Waghala City Municipal Corporation in developing NMV lanes and tracks to promote NMV modes.

Community engagement and its merits have long been recognized in the field of spatial planning but is yet to be mainstreamed in the case of transport planning. It not only enables better and customized solutions (need based) to problems, but also engages the users and creates a positive outlook ensuring better acceptability by the users. One instance of using community participation for plan preparation is the initiative called ‘Aap ki sadak: Alternative Mobility Solutions and Pedestrianisation of Existing Urban Neighbourhoods’. The initiative involved the residents and the civic bodies to make neighbourhood streets pedestrian friendly and enjoyable, and access to the Metro and other public transport convenient. Another similar initiative is Raahgiri day wherein certain road sections are banned for motorized vehicles. These road stretches are then used for organizing various community engagement activities like yoga/dance classes, plays, musical performances by various groups etc.

Transportation and land use planning decisions overlap. Transport planning decisions affect land use development, and land use conditions affect transport activity. These relationships are complex, with various interactive effects. Efforts are being made to make this process simpler. Land use **Transport Integration** category includes details of Prahladnagar Town Planning Scheme of Ahmedabad, Gujarat and snapshot of Transit Oriented Development (TOD) around BRTS corridors in Pimpri Chinchwad.

INTRODUCTION

BACKGROUND

As per Census 2011, a large proportion of India's population still lives in its villages. Only about 31 per cent of the total population lives in urban areas (about 5,161 towns and cities), which generate 60% of the nation's GDP. Although the overall urbanization percentage seems low at 31 per cent, it is an improvement by four percentage points over the urbanization as registered in Census 2001. The pace of urbanization is now set to accelerate as the country readies itself for more rapid growth. It is estimated that around 535 million people (38%) would be living in urban areas by 2026 and 590 million by 2031.

As the urban population and income increases, demand for key services such as transportation, water, sewage treatment, and low income housing will increase five to sevenfold in cities of every size and type. In the past, policy makers in India have always stressed on checking rapid urbanization and migration through introduction of various schemes for rural households. In fact, urbanization is a result of the development process. Despite the challenges, urbanization is an opportunity for furthering economic development and provision of quality of life.

Amongst various urban services, urban transport is a very important service for the overall development of the country. Urban transport provides mobility of people and goods and access to employment, education, shopping, health, entertainment opportunities. It also affects the income levels of people, land values and environment. In nutshell, it determines the quality of life in an area.

Many cities are unable to meet the increasing demands for travel due to the prevailing imbalance in the modal split; inadequate transport infrastructure and its sub-optimal use; lack of integration between land-use and transport planning; and no improvement or little improvement in city bus services, these factors collectively encourage a shift to more personalized modes of travel. In order to support the required level of economic activities in urban areas, it has become imperative to address urban transport issues on an urgent basis.

A number of innovative initiatives have been undertaken and some are under implementation to develop a sustainable urban transport system. Many cities have prepared Comprehensive Mobility Plans and have plans to introduce modern bus services; Bus Rapid Transit Systems (BRTS) are planned in fourteen cities and new metro rail systems are being planned/under implementation in eight cities. Under the Jawaharlal Nehru Urban Renewal Mission (JnNURM), the Ministry of Urban Development (MoUD) has suggested reforms such as setting up a Special Purpose Vehicle (SPV) to manage bus services, creation of a Unified Met-

ropolitan Transport Authority (UMTA) in million plus cities to coordinate urban transport and a dedicated urban transport fund at city as well as state level.

Of the various urban transport initiatives which have been undertaken, several initiatives/projects have been successful and can be replicated in other cities. Documentation of best practices as well as learning from challenges and constraints faced during the implementation process would be useful for future planning and implementation.

The present document is accordingly an effort towards compilation and dissemination of a compendium of good practices in the area of urban transportation. It also aims to provide information about the initiatives undertaken by city authorities under the JnNURM scheme and by other cities in this area.

The National Institute of Urban Affairs (NIUA) is the National Coordinator for the PEARL initiative. PEARL or 'Peer Experience and Reflective Learning' initiative was launched on 31st January 2007 at Hyderabad. It is a program that enables effective sharing of knowledge (related to planning; implementation; governance and; sustainability of urban reforms and other infrastructure projects) among the cities that are being supported by JnNURM.

The PEARL initiative provides a platform for deliberation and knowledge exchange to Indian cities and towns as well as professionals working in the urban domain. The network has been quite successful as a sharing point for projects and reforms carried out by ULBs. However, it needs to enhance its role as a knowledge exchange platform by building a more comprehensive database of processes needed for improved planning for cities and more efficient delivery of services. Sharing of good practices is one of the most important means of knowledge exchange and numerous innovative projects are available for reference on the PEARL portal/website. The 'Knowledge Support for PEARL' is a program supported by Cities Alliance that aims to qualitatively further this initiative. One of its components is to carry out a thematic and detailed documentation of good practices.

One of the themes that have been chosen for this documentation is "Urban Transportation". The theme covers practices, projects and innovations in improving the quality, efficiency and sustainability of urban transportation in Indian cities. It also strives to study examples of people's participation in these projects for overall enhancement of inclusive and sustainable planning. **ICRA Management Consulting Services Limited** has been entrusted with the task of preparation of the compendium.

ABOUT THE PROJECT

As mentioned above, this study is an effort towards compilation

and dissemination of a compendium of good practices in the area of Urban Transportation to inform the initiatives undertaken by JnNURM and other cities in the field of Urban Transport. The documentation focuses on critical factors such as successful implementation, inclusivity, access, replicability, financial sustainability and contextual nuances.

SCOPE AND LIMITATIONS

Deriving from the overarching study objective, IMaCS articulates the following scope and limitations for undertaking the study:

- The key scope of the task is detailed documentation six detailed good practices and seven snapshots representing Urban Transportation in various categories;
- Development of formats for inventorisation, detailing and documentation of select best practices;
- Preparation of a comprehensive inventory of projects from which six projects can be selected for documenting good practices;
- Recommendations and suggestions regarding the categories for compilation of Urban Transport Projects (Urban Transport Management, Technology in Transport, Inclusive Transport, Green Low-Carbon Transport, Community Engagement & Land-use Transport Integration); and
- Support for preparation of Dissemination Strategy and Workshop.

APPROACH AND METHODOLOGY

During the course of this assignment, IMaCS envisaged to:

- Work through a participative and consultative process with the NIUA, ULBs and other stakeholders in order to ensure

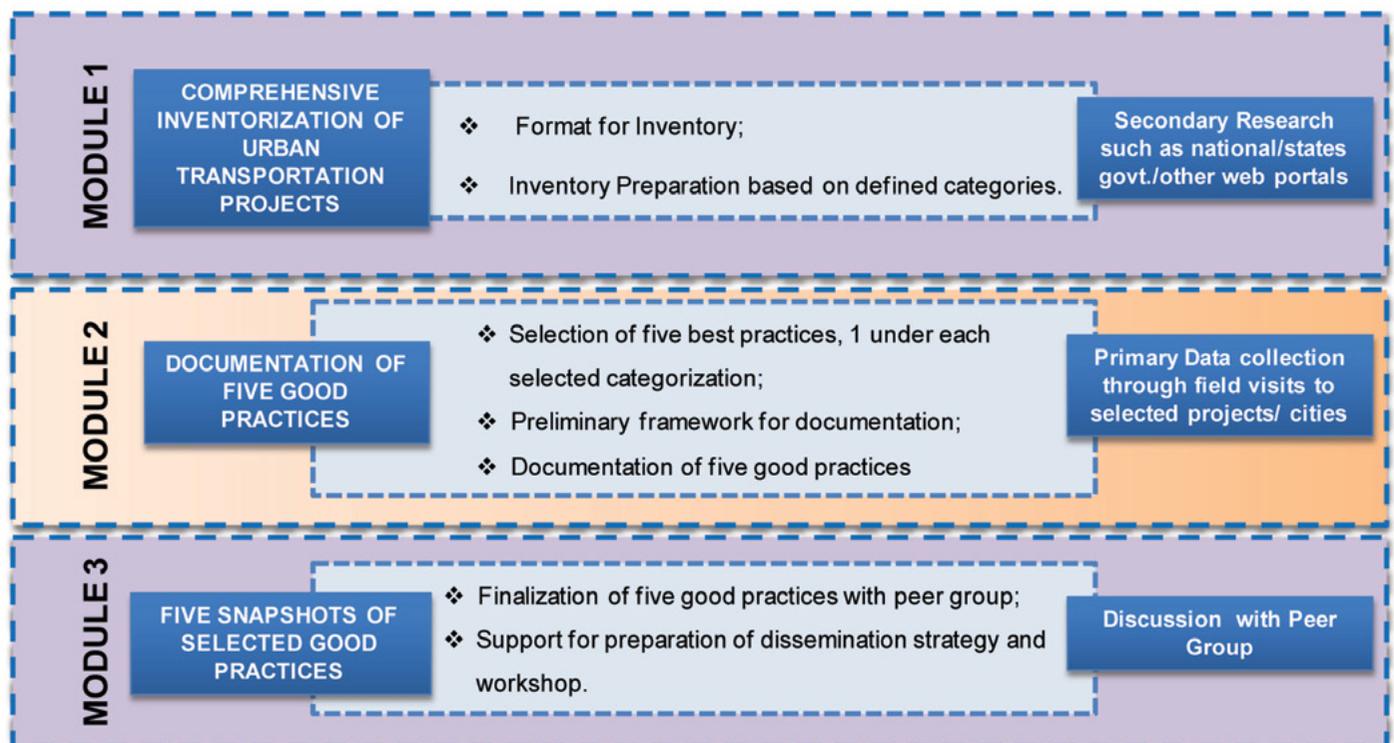
smooth progress of the assignment through the various stages.

- Build on ongoing and earlier efforts to ensure that the existing and ongoing efforts are factored in during the diagnostic and analysis phases. Good practices will be catalogued and documented into well-defined categories which would help the cities in identifying practices that target specific challenges. An illustrative list of categories include urban transport management; technology in transport; inclusive transport; green/low carbon transport; community engagement etc.
- Create a collaborative working team with the Peer Review Group and NIUA to arrive at best 5 case studies in the urban transportation sector as envisaged in the ToR.

This section details the approach and methodology adopted to achieve the objective envisaged under this assignment. IMaCS completed this study in 3 Modules where Module I was undertaken as an upfront activity to prepare the sector inventory, Module II involved documenting the 6 detailed best practices along-with 7 snapshots and Module III included finalization of selected cases and dissemination of workshop at the national level.

Module I: Preparation of a comprehensive Inventory

The first step in the exercise was to work in collaboration with NIUA in preparing a comprehensive inventory of projects from which 13 were selected to be included in the documentation of good practices. IMaCS captured good practices in the urban transportation sector through a literature review of good practices documented by various agencies and other relevant



institutions in Indian cities plus secondary data available from various sources including web portals of Ministry of Urban Development, JNNURM, UIDSSMT and state governments/agencies.

Module II: Documentation of Thirteen good Practices

Under Module II, the focus was on documenting the selected good practices based on discussions with the peer review group. This included the following:

- **Selection of Good Practices:** Based on discussions with the peer review group on the inventory of projects, a total of 13 good practices were selected for documentation. The 1st preferred cases were considered for detailed documentation as good practices and the following preferred cases were documented in the form of a snapshot only.
- **Finalization of formats of documentation:** IMAcS modified the formats for documentation of good practices and project snapshot provided by NIUA in its ToR to capture the essence of the projects in detail. These formats were finalized after consultation with the peer review group. The consultant captured information on a best-efforts basis on various aspects including the initial status, chronological process documentation, impact, cost-benefit analysis (before-after situation), finance and resource management, experts/firms involved and replicability.
- **Primary data collection and field visits:** The consultant visited the cities and undertook interviews with key officials at the ULB level to capture information on the good practices identified.
- **Documentation of Good cases:** The documentation of “good” cases was done based on information provided by respective cities and information available from reliable sources in the public domain.

Module III: Finalization of Six Good Practices and Snapshots

The documentation of six detailed and seven snapshots to be finalised based on discussions and inputs/feedback received from the Peer Review Group. After multiple rounds of discussions, six categories in all were finalized for documentation and that six detailed projects and seven snapshots should be covered under this documentation.

The following six categories would be covered under which the good practices would be segregated and documented:

1. **Urban Transport Management:** Macro and micro level initiatives that lead to optimisation of existing transportation networks and operation.
2. **Technology in Transport:** Intelligent Transportation Systems that improve system performance, safety, efficiency, produc-

tivity, service, environment, energy, mobility, etc. including technology innovations such as GPS based fleet tracking for route planning of public buses, real time tracking/information systems, vehicle to vehicle communication etc.

3. **Inclusive Transport:** Measures that render inclusivity to urban transportation with respect to gender, age, differently-abled persons, etc.
4. **Green Low-Carbon Transport:** Innovative approaches for introducing green, low carbon transport, eco-mobility, etc.
5. **Community Engagement:** People’s participation in overall enhancement of urban transportation.
6. **Land-use and Transport Integration:** Initiatives involving inclusion of transport related infrastructural requirements along-with land use planning with an effort to enhance accessibility and in turn reduce overall trip making requirements.

The present study is based on both limited primary as well as secondary data. A team of researchers visited the cities in which the selected projects have been initiated. The team collected the data/information on completed and ongoing projects from the concerned officers of the transport authorities and consulted different stakeholders involved. The team also deliberated upon the constraints faced by the officials in implementing the projects and reasons for the success of the projects. The report doesn’t cover scientific validation of claims/ benefits as provided to the project team by respective concerned authorities.

REPORT STRUCTURE

The present document is the **Final Report** submission towards the slated study that articulates our understanding of the assignment, discusses the underlying analytical methodology adopted by the consultant to prepare the documentation report. This documentation highlights factors that have contributed to successful implementation, inclusivity, access, replicability, sustainability and contextual nuances of select good practices.

The Report has been structured along the following lines:

Chapter 1 discusses the project background, study objectives, methodology and scope of work;

Chapter 2 attempts to highlight the urban transport infrastructure gap, investment needs, focus of improvements i.e. performance systems or source augmentation, recent policies that govern the sector, recent technological improvements etc; and

Chapter 3 provides an introduction to the categories under which the projects have been documented, an inventory highlighting the cases selected for detailed and snapshot documentation and finally details of each of the shortlisted projects.



SECTOR OVERVIEW

Amongst various service sectors, urban transport is an important sector which affects the mobility of people and ultimately the economic growth of urban areas. Many cities in India are not able to meet increasing demands for travel due to existing imbalances in the modal split; inadequate transport infrastructure and its sub-optimal use; lack of integration between land-use and transport planning; and no improvement or little improvement in city bus service which encourages shift to personalized modes.

ISSUES/CHALLENGES RELATED TO URBAN TRANSPORT

Some important issues/challenges related to urban transport are as follow:

- Growing transport demand due to rapid urbanization - inadequate public transport and increasing use of personalized vehicles;
- Lack of institutional co-ordination among agencies belonging to different levels of the Government;
- Inter modal integration - mix of slow and fast moving vehicles without segregation;
- High and increasing trip rates (1.2; likely to cross 2/per capita);
- Increasing trip lengths/travel times;
- High and rapid motorisation rates;
- Low number of cars per thousand population;
- Poor air quality;
- High and increasing (in many cities) road fatalities;
- Network inadequacies;
- Largely unorganized urban transport industry;
- Choice for fuel and vehicle technologies;
- Lack of financing;
- Viability of Public Private Partnership (PPP);
- Neglected area of non-motorised transport;
- Lack of integration of land use and transport planning;
- Technologies for public transport; and
- Increasing level of congestion and pollution (rising levels of carbon emission) affecting the environment.

In order to support the desired levels of economic activities in urban areas, it becomes imperative to address urban transportation issues. In view of this, some of the major initiatives undertaken by the Ministry of Urban Development are as follows:

i. Formulation of the National Urban Transport Policy (NUTP) in May 2005 and approval by the Cabinet in April 2006.

ii. Sector reform linked investments for transport and related infrastructure under JnNURM.

iii. Human resources and capacity enhancement.

National Urban Transport Policy

NUTP primarily focuses on the mobility of people (rather than that of vehicles), reduction of travel demand by encouraging integration of land use and transport planning and sustainable transport solutions. It encourages investments in public transport and non-motorised modes, introduction of Intelligent Transport Systems (ITS), and facilities for the use of non-motorised modes; capacity building - individual and institutional - revolving around legal and administrative issues; greater involvement of the private sector; innovative financing mechanism for enhancing efficiency and reducing the impact on the public budget; projects to demonstrate best practices in sustainable transport; establishment of regulatory mechanisms for level physical planning; strategies for efficient use of parking space and freight traffic movements; coordinator for planning for urban transport; equitable allocation of road space; use of cleaner technology; and awareness campaigns for citizens.

JnNURM Reforms

Keeping in view NUTP and related transport issues, the Ministry of Urban Development suggested the following reforms under JnNURM tied with Additional Central Assistance:

State Level

- Setting up of a city-level Unified Metropolitan Transport Authority (UMTA) for all one million plus cities, duly backed by a legislation, to facilitate coordinated planning and implementation of projects relating to urban transport and their integrated management.
- Setting up of a Dedicated Urban Transport Fund at the state level.
- Change in bye-laws and Master Plan of cities to integrate land-use and transport by densification along with the MRTS corridors and areas around the stations.
- Nominating a single department at the state level to deal with all urban transport issues as against different departments at present.
- Setting up of a regulatory/institutional mechanism to periodically revise fares for all public and intermediate public transport systems.
- The State government and ULB waiving/reimbursing all their taxes on urban buses and city bus service/BRTS.

City level

- Setting up of a Dedicated Urban Transport Fund at the city-level.
- An advertisement policy which taps advertisement revenue on public transport, intermediate public transport and public utilities for public purposes subject to relevant legislations.
- Parking policy wherein parking fee represents the true value of the land occupied, which is used to make public transport more attractive; banning of parking on arterial/ring roads, multi-level parking centres in City Centres with park-and-ride facility etc.
- A well organized and efficient city bus system by using ITS through city-specific SPV for bus services, preferably on PPP, under well-structured contracts where the umbrella institution of the government professionally does the role of planning, coordination, contracting, monitoring, supervision as well as management of common infrastructure and services etc.
- Multimodal integration, including integration with suburban railways (by involving MoR) to provide network-connectivity in the region and single ticketing to provide seamless travel.
- Setting up of a Traffic Information Management Control Centre for effective monitoring and enforcement of traffic as well as data-generation and data-collection for future planning.
- The parastatals/ULBs to enter into MoA with the Mission Directorate to undertake the above reforms in addition to reforms as per UIG guidelines. There shall be a time bound plan for implementation of all these reforms within the mission period.

About 22% of the projects sanctioned under JnNURM are for urban transport (NUTP compliant).

URBAN TRANSPORT INITIATIVES/PROJECTS

A number of initiatives/projects have been undertaken or are being undertaken in the field of urban transport and related infrastructure to solve the transport issues and maintain mobility. As per JnNURM reforms several cities have prepared Comprehensive Mobility Plans and plan to introduce modern city bus services. Bus Rapid Transport systems are planned in 14 cities, metro rail systems are being developed in eight cities, Unified Metropolitan Transport Authorities have been developed in 7 cities, the Government has been funding 15,260 modern and intelligent transport systems in the mission cities for the last many years, many cities are developing automated multi-storeyed parking systems in PPP, etc. The details of some major initiatives are given below.

Metro Rail Projects

MoUD is also supporting metro rail projects in bigger cities. In Delhi, metro is under operation for 186 km of the network. Metro rail projects have been promoted under joint ownership

THE FOLLOWING CITIES HAVE BEEN DEVELOPING METRO RAIL PROJECTS

City	Total Cost (Rs. crore)
Delhi	18,382.50
Mumbai	17,617.50
Bangalore	7,812.00
Kolkata	4,666.50
Chennai	13,977.00
Hyderabad	11,871.00
Cochin	2,776.50
Jaipur	10,000.00

Source: H.M. Shivanand Swamy, CEPT University, Urban Transport in India: 12th Five Year Plan, Govt. of India, June 10, 2011

with concerned state governments in Delhi, Bangalore, Kolkata and Chennai. A viability gap funding of 20 per cent for urban transport projects is offered on PPP projects in Mumbai and Hyderabad.

Bus Rapid Transit System

As the metro rail system is hugely capital intensive and may not be operated in medium/small cities, the road based BRTS is an alternative to meet the increasing demand for public transport in which buses are operated in an organized way. BRTS projects for 465 km have been undertaken in **14 cities at a total cost of US\$ 1100 million** (@US\$ 2.4 million per km), viz. Delhi 500 km, Pune 101.77 km, Pimpri-Chinchwad 42.22 km, Bhopal 21.71 km, Jaipur 39.45 km, Vijaywada 15.50 km, Vizag 42.80 km, Rajkot 29.00 km, Kolkata 15.5 km, Ahmedabad 88.50 km, Surat 29.90 km, Hubli-Dharwad 22.00 km, Indore 11.45 km.

Ahmedabad is the first city in India to have successfully launched a full BRT system. NMV and pedestrianisation schemes are integral to the development policy but are susceptible to slow progress of implementation.

Modern City Bus service¹

Under the JnNURM economic stimulus package, funding and procurement of 15,260 buses for 61 mission cities has been sanctioned at a cost of US\$ 1,020 million, with a waive off of state and local taxes on public transport (upto 16%). About 11,500 buses were on the road by 30th April 2011. City buses have been planned for 118 more 200 thousand plus population cities.

These buses are low floor (400 mm), semi low floor (650 mm) and standard buses (900 mm) as against the prevailing floor height of 1,100 mm and have ITS features such as LED sign boards, audio visual passenger information, multiplexing, on board diagnostics, cameras, integrated controller GPS, GPRS, and smart card ticketing machines.

¹Status of Release of ACA under Bus funding project under JnNURM, 31st December 2012



Harini Calamur

Bus Funding Programme under JnNURM

With the aim of encouraging urban level reforms and speeding up the development of infrastructure in the identified 'mission cities', the Ministry of Urban Development, Government of India launched the JnNURM in 2005. 63 mission cities, with 2 more added later, were identified for the reforms. Under these reforms, funding has been allotted to a comprehensive bouquet of sectors, urban transportation being one of the key sectors. Whilst the above funding for urban transportation covered varied infrastructural improvements, a second stimulus package particularly for procurement of buses was announced by the government in January 2009. Four cities from Gujarat, namely: Vadodara, Surat, Rajkot and Porbandar did not seek funding under this stimulus package, thus leaving 61 mission cities. The scheme was linked to various state and city level urban transport reforms, which saw extraordinary response from the participant cities leading to approval of Additional Central Assistance (ACA) of Rs. 2,092.1 crore and 15,260 buses.² The bus procurement scheme was primarily aimed at:

- Providing commuter friendly buses;

- Ensuring implementation of institutional and service reforms for bus-based public transport.

The bus funding scheme has been extremely successful and is likely to have induced a modal shift in favour of bus-based urban transport. This success has recently led to extension of the JnNURM bus funding scheme with a focus on procuring 10,000 new buses.

The authorities may get funds for procuring buses if they fulfill the following conditions:

- Prepare updated City Development Plan (CDP) and City Mobility Plan (CMP);
- Establish baseline scenario for public transport;
- Identify projects for bus based Public Transport (PT) services, covering fleet, infrastructure and ITS;
- Follow urban bus specifications for fleet procurement;
- Funding only to ULBs/para-statals who set up SPV, UTF, UMTA;
- Waive/reimburse state and ULB taxes for bus procurement.

Present Status of Bus Funding Programme³

- Sixty one mission cities secured funding for 15,260 buses with total funds of Rs. 14,160 crore;
- Rs. 6,276 crore as Central Government share approved, Rs. 4,323 crore distributed till 2012;
- For FY14, additional bus funding allocated to 100 cities/

² Status of Release of ACA under Bus funding project under JnNURM, 31st December 2012

³ Status of Release of ACA under Bus funding project under JnNURM, 31st December 2012, Details of buses sanctioned under new bus funding scheme under JnNURM (No. K-14011/30/2013-UT-I)

- towns and 21 clusters, spread over 19 states;
- iv) Out of 100 cities, 19 are mission cities receiving about 5,600 buses from a total fleet of 10,500 buses. An allocation of Rs.14,873 crore undertaken during FY14;
 - v) The latest funding mandates procurement as per Urban Bus Specification-II and is expected to benefit manufacturers, operators, regulators and commuters.

Funding from earlier studies

A study of the status report on bus funding under JnNURM brought out the following main aspects:

- i) For the 63 cities and two mass transport operating agencies, status categorized under procurement, funding, support infrastructure and reforms;
- ii) Barring a few, most cities implemented reforms;
- iii) Absence of information on progress on supporting infrastructure and reforms in most cases;
- iv) In a few cases, the required reform instruments were still under consideration.

A study on status of UMTAs – a mandatory reform for bus funding under JnNURM brought out that a number of UMTAs have come into existence in a few cities and states, however almost none have achieved the desired satisfactory performance levels due to lack of legislative/financial/technical support and strength.

Appraisal of JnNURM Reforms, March 2011

An appraisal of JnNURM reforms has been carried out in accordance with the scope of work in March 2011. The appraisal has been done on the basis of the pre-approved sample of 66 cities (41 Mission cities and 25 Non Mission cities) and on the basis of primary information collected from these 66 cities, secondary information as made available by MoUD and MoHUPA as well as information gathered and discussions held with various stakeholders while conducting the appraisal. The main findings of the appraisal in respect of urban transport brought out the following key conclusions:

- i) By segregating the formulation of CDPs and CMPs, integrat-

ed land use planning could not be undertaken. Consequently the reforms programme ended up supporting standalone road development projects under the urban transport sector.

- ii) In reference to the bus funding scheme, the expected increase in modal shifts in favour of public transport needs evaluation.
- iii) The program has definitely been successful in initiating improvements in the urban bus transport system through:
 - Formation of SPV;
 - Operations under PPP;
 - Use of modern technology in O&M in the city bus system; and.
 - Improvement in vehicles for a comfortable and convenient ride.
- iv) The focus on non-motorised transport received support from program funding. However, several cities opted for implementing dedicated cycle tracks and walkways.

OTHER MOUD INITIATIVES FOR URBAN TRANSPORT PLANNING & CAPACITY BUILDING

In order to promote better practices:

- The Ministry provides Central Financial Assistance up to 80% of the cost for:
 - Undertaking various studies relating to preparation of CMP;
 - Launching of awareness campaigns; and
 - Developing Clean Development Mechanisms etc.
- For preparation of Detailed Project Reports (DPR), financial assistance is given upto 50% of the cost of preparation of DPR;
- Training of trainers and practitioners conducted;
- Institute of Urban Transport to support ministry in capacity building initiatives;
- Four Centers of Excellence in Urban Transport: CEPT University Ahmedabad, IIT-Delhi, IIT-Madras, NIT-Warangal are conducting new training programmes for capacity building.

CHAPTER 3

GOOD PRACTICES IN URBAN TRANSPORT

As seen from the previous chapter there is a need to discuss and document the initiatives that have had positive impacts and through which the desired targets have been achieved. However, there would have been some problems/challenges/constraints which the concerned authorities might have faced during the process of their implementation. If a project achieves its targets and has positive impacts, it is treated as a successful project and can be replicated in other urban areas. Problems/

constraints faced at the time of their implementation give cues to planners/implementation agencies/managers to take care of them in future upcoming projects. The present study discusses the success stories (Good Practices) at large indicating the reasons for their success, their impacts and also constraints encountered during the process of planning and implementation of the projects. In all, 7 snapshots and 6 detailed documented projects have been included as part of the final report.





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CATEGORY I

URBAN TRANSPORT MANAGEMENT

As cities become the engines of economic growth, city officials and decision makers face a challenging task of developing and maintaining efficient urban transport systems. These systems must address the problems of severe congestion, deteriorating air quality, energy sustainability, and increasing numbers of road accidents. However, urban transport planning and management is complex. It is more than about choosing technologies. It involves the consideration of a variety of factors such as affordability, local culture, environmental issues, financing, energy use, and impacts on special population groups such as the young and the old.

Urban transport management is aimed at solving negative externalities occurring due to road traffic (gap in demand and supply for mobility). For this measure, both private and public transport modes need to be managed by a planning authority which has control over some decision variables: road pricing (includes tax on vehicles as well as fuel, parking charges, congestion charges, etc.), transit ticket prices, and the service characteristics of transit systems. The multimodal transport system is subject to some constraints: physical and environmental capacity constraints, and budget constraints. In some cases an upper bound is imposed on the ticket price, in order to help people who are captive of transit. The planning authority fixes the level of all user charges and the transit service characteristics, in such a way that the average generalized cost of transport is minimized, and at the same time the transport system is in equilibrium and all constraints are satisfied. Along with pricing strategies, customization of the entire transport system of the town to suit its particular characteristics is the key to maximization of output in terms of mobility.

In the current scenario, with the fast pace of development of urban centers in India, better management of the transport system would be vital to maintain robust growth of the cities both spatially and economically. The market for urban public transport is a niche market, whose properties, especially the characteristics of transit systems, are essentially determined by the physical and environmental capacity constraints of the road transport system. Hence, management measures for optimal utilization of the road system as well as maximization of public transport usage would play an important role in overall performance of the urban transport system.

Recognizing the potential as well as need for urban transport management, a number of Indian cities have come up with innovative measures to improve the efficiency of their transport systems. The following section provides a list of such projects

initiated by city authorities in order to manage urban transport systems in respective cities.

Out of the above listed projects, **Urban Transport Services for Medium and Small Size Cities of Karnataka** has been included in this section as the detailed documented project. This initiative has proven that public transport systems can be practical and viable in these small and medium cities. The project claims increase in ridership, journey speed, revenue collection, and reduction in greenhouse gas (GHG) emissions.

The city of Rajkot in Gujarat has a transport network that is heavily dependent on two-wheelers and auto rickshaws. In order to combat this problem and make the auto experience more enjoyable the Rajkot Municipal Corporation (RMC) together in a PPP with the Nirmal Foundation, implementers of the “G-Auto” rickshaw scheme that began in Ahmedabad and which has since spread to other cities in Gujarat such as Gandhinagar and Baroda, initiated the system. The G-Auto system organises rickshaws into a branded and marketed fleet, thus necessitating greater operational accountability that leads to quality, reliable service. Positive outcomes of the project include higher reliability in auto-rickshaw services, safer operations leading to reduction in accidents and higher income for auto-rickshaw drivers. This initiative has been included as one of the snapshots in the urban transport management category.

S. No.	Name of the Project	Location
1	Any Time Rickshaw Service: C Auto	Rajkot, Gujarat
2	Mumbai Urban Transport Project: Suburban Rail Transport Project	Mumbai, Maharashtra
3	Innovative Public Transport Solution in Shimla town	Shimla, Himachal Pradesh
4	Corporatization of Private Stage Carriage Buses in Delhi	Delhi
5	Urban Transport Services for Medium and Small Size Cities, Karnataka	Gulbarga, Bijapur, Bellary, Hospet, Bidar, and Yadgir, Karnataka
6	Traffic Transit Management Centres	Bengaluru, Karnataka

URBAN TRANSPORT SERVICES FOR MEDIUM AND SMALL SIZE CITIES, KARNATAKA

Abstract

One of the primary intentions of forming an independent corporation was to cater to the demands of the local area under its jurisdiction. Along with inter-city operations, local city transport needs are also addressed by the corporation. The overcrowded autos and IPTs running on sharing basis, along with unstructured and high fare system were not able to cater to the transport needs of the cities. Hence, North Eastern Karnataka Road Transport Corporation (NEKRTC) was formed in the year 2000 after bifurcating from the Karnataka State Road Transport Corporation (KSRTC) with the objectives of popularizing the use of public transport as the preferred mode of transport against the personalized and other IPT modes at an affordable fare structure.

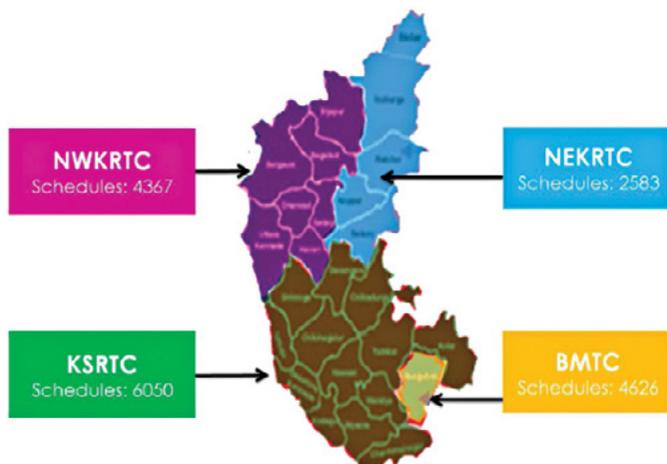
Background

Public transportation in Karnataka is managed by Karnataka State Road Transport Corporation (KSRTC) set up in 1961 under the provisions of the Road Transport Corporation Act 1950. On a regional basis, 3 corporations were carved out:

- Bangalore Metropolitan Transport Corporation (BMT), Bangalore on 15-08-1997.
- North Western Karnataka Road Transport Corporation (NWKRTC), Hubli on 01-11-1997.
- North Eastern Karnataka Road Transport Corporation (NEKRTC), Gulbarga on 01-10-2000.

Need of the Project

The jurisdictional area of the corporation consists of seven districts (Gulbarga, Bidar, Yadgir, Raichur, Koppal, Hospet, Bellary and Bijapur). The area consists of many small to medium sized cities with population varying from several thousands to several lakhs.



Except in cities such as Gulbarga, Bellary, and Raichur, there was absence of an organized PT system in the form of city buses. This had resulted in a proliferation of IPT modes with a monopolistic attitude. Exorbitant fares and overcrowding in IPT modes was a matter of discontent in the public. A meager presence without reliable frequency had also resulted in city buses having loss making operations. Results emanating from traffic studies clearly indicated the need for an organized public transport system.

Solving all the issues mentioned above became the foremost priority for NEKRTC. This led to introduction of sustainable bus services with an affordable fare structure in all the middle sized cities of the corporation.

Project Description

The CTTP prepared for Gulbarga by DULT helped conceive the idea of initiating city bus services in Gulbarga (the head quarter of NEKRTC). The study highlighted the need for and major routes of operation along with expected demand. These helped build the rationale for city operations.

The long term objectives of the project were to popularize the use of public transport as the preferred mode of transport against the personalized and other IPT modes at an affordable fare structure. This in turn would promote public safety, reduce vehicular congestion on the road and of course reduce the air pollution levels caused due to the increased vehicles on roads.

The demand for public transport was ascertained through an extensive traffic and transport survey. The related data for the city of Gulbarga was available in the CTTP. The demand corridors were identified through the travel demand model developed, along with physical assessment of road type and width. Setting forth a mechanism to operate buses from all corners of the city was ruled out as it would need more numbers of buses. It was therefore decided to make the CBD of the city the hub and operate buses diverged across all corners. With this it was hoped that one could travel from any corner of the city to any other corner with just one change of bus on a common hub.

The road network in some parts of the city was not conducive to the operation of bus services. The operations were initiated with the assumption that there would be a significant modal shift in favor of public transport, thus reducing the congestion being caused by private vehicles. Also, stricter enforcement on parking bans were introduced.

Another aspect determining the success of the project was the identification of bus stop locations to keep them well within the reach of the potential commuters. A joint survey with stakeholders such as traffic police, city development authority and

Municipal Corporation was undertaken and locations for bus stops were identified. The project report was also approved by CEPT University Ahmedabad and EMBARQ, India.

Guiding Policy Document/Act/Notice

The Government of India in January 2009 announced a second stimulus package under the JnNURM scheme particularly for procurement of buses. 61 cities out of a total 65 JnNURM mission cities opted to procure buses under this scheme.

Project Implementation

Methodology

Since the objective was to operate and popularize the city buses, the most important aspect was to identify the corridors for the operations. The CTTIP studies conducted by DULT had results of the turning count, volume count, OD survey etc., which served as the baseline. Most of the corridors identified from the survey findings correlated with the experience of operating city services. Apart from this some surveys were conducted which also arrived at similar outcomes as other surveys.

Alternative Analysis (Route Rationalization)

In the first alternative routes for bus operations were identified from one end of the city to the other end. This scenario would need more numbers of buses to cover the entire city, increasing the capital as well as operational cost.

As a solution the CBD (super market) of the city was decided to be made the main hub of operations and the Central Bus Station as a second hub with all routes diverged away from these

hubs to all parts of the city. By doing this, one could travel from anywhere within the city with just one change. In this way all activity centers and traffic nodes were connected, with an initial frequency of 5 minutes for dense corridors and 10 to 15 minutes for other corridors.

Technical Innovations

Most of the buses which operated as city buses were old buses having completed around 5.5 lakh km. Their intercity operations were modified with an additional door and a change in the seating arrangements. This needed to be changed if operations were to be viable and attractive to the public. Urban Bus Specifications were taken as the benchmark while designing buses. The road network of the city does not support semi low floor or low floor buses. Keeping in mind all these factors some innovations were made to the buses. The salient features of the buses designed are as follows.

- LED destination board one each situated in the front and back side as well as inside of the bus with GPS based current and next stop announcement.
- Ergonomically designed bucket model seats.
- Pneumatically actuated passenger doors.
- Elegant interior and exterior design.

Results and Impacts

The primary objective of the project was to popularize the use of public transport against the use of personalized vehicles and IPTs. Periodical surveys were conducted in each city to ascertain the impact of the project. A very significant fact to be considered

CHALLENGES ENCOUNTERED

Challenge	Resolution
Financial Viability of the Bus Operations	City Visits to Tumkur and Ahmedabad. Focus on providing safe, convenient travel to residents by keeping the cost structure minimal. <i>It is learnt through the experiment in BRTS Ahmedabad that keeping the fares within the reach of the common man goes a long way in getting the public used to the comforts of city bus services.</i>
Capital Investment	DULT, Bangalore funded 50% of the total cost for procurement of rolling stock.
Supportive Road Network	As an operating unit of city bus services, the only solution available was to keep in touch with the local traffic police to operate buses, and to request the local authorities to undertake further developments in line with creating an environment for convenient operation of city buses in the future.
Identifying Bus Stops	Stakeholder interaction with government agencies, traffic police etc.
Operating Crew for Bus Operations	Selection from the existing pool of drivers and conductors. Age group between 25 and 40, educational background, and behaviour etc. were the main eligibility criteria for selection to operate the city buses. They were also given a set of uniforms to identify them differently from the crew operating other schedules. Creating a separate identity for themselves instilled in them a unique sense of pride. A separate training was given to improve behavioural skills along with overall grooming for better trust in the system by commuters.
Brand Building of public transport operations amongst the city residents	Keeping fare structure to a minimum. The alternate mode available is IPT with a minimum fare of Rs. 5. As an introductory offer, minimum fare was fixed at Rs. 3 with gradual increase considering the sensitivity of users to the fare.

TABLE 1: PRE AND POST OPERATION FACTORS FOR CITY BUS OPERATIONS IN GULBARGA, BIJAPUR AND BELLARY

S. No.	Particulars	Gulbarga			Bijapur			Bellary		
		Before Introduction	Present operation	Change (%)	Before Introduction	Present operation	Change (%)	Before Introduction	Present operation	Change (%)
1	No. of buses	17	78	61 (459)	27	54	27 (200)	33	33	16 (194)
2	Route Length (Km)	53.4	165.5	112.1 (310)	85	145.5	60.5 (171)	14	14	6 (175)
3	No. of Routes	8	22	14 (275)	5	12	7 (240)	138.1	138.1	62.6 (183)
4	Route Km	2694	12665	9971 (470)	3456	8212	4756 (238)	4762	4762	2858 (250)
5	Revenue per day per bus (In Rs.)	3235	5174	1939 (160)	2959	5247	2288 (177)	4170	4170	1090 (135)
6	Occupancy Ratio	60%	98%		60%	114%		85%	85%	
7	Total Ridership per day	18,000	94426	76426 (525)	16902	69390	52488 (411)	32505	32505	19245 (245)
8	Ridership per bus	1,059	1,250	191 (118)	626	1285	659 (205)	985	985	205 (126)
9	Vehicle Utilization (In Km)	147	180	33 (122)	128	152	24 (119)	144	144	32 (129)
10	Passenger/Km	6.68	7.3	0.62 (109)	4.89	8.45	3.56 (173)	6.61	6.83	0.22 (103)
11	Average EPKM	17.5	32.25	14.75 (184)	22.5	34.5	12 (153)	28.9	28.9	11.65 (168)
12	Average CPKM (In Rs.)	23.5	30.2	6.7 (129)	25.5	30.3	4.8 (119)	30.7	30.7	6.2 (125)
13	MPKM (In Rs.)	-6	2.05	8.0 (800)	-3	4.2	7.2 (720)	-1.8	-1.8	5.45 (545)
14	Fare box recovery ratio	0.74	1.07	0.33 (145)	0.88	1.14	0.26 (130)	0.7	0.94	0.24 (134)

TABLE 2: PRE AND POST OPERATION FACTORS FOR CITY BUS OPERATIONS IN BIDAR, YADGIR, HOSPET AND KOPPAL

S. No.	Particulars	Bidar		Yadgir		Hospet		Koppal	
		Before Introduction	Present operation	Change (%)	Before Introduction	Present operation	Change (%)	Present Operations	Present Operations
1	No. of buses	5	16	11 (320)	6	13	7 (217)	20	12
2	No. of Routes	2	5	3 (250)	1	4	3 (400)	4	3
3	Route Length (Km)	25.5	36.3	10.8 (142)	12.5	22	9.5 (176)	43	13.1
4	Route Km	575	2487	1912 (433)	660	1840	1180 (279)	3356	1736
5	Revenue per day per bus (In Rs.)	2893	5037	2144 (174)	3410	4750	1340 (139)	4580	4175
6	Occupancy Ratio	60%	98%		51%	96%	0.45	118%	97%
7	Total Ridership per day	3750	19360	15610 (516)	5508	16107	10599 (292)	20200	13824
8	Ridership per bus	750	1210	460 (161)	918	1239	321 (135)	1278	1152
9	Vehicle Utilization (In Km)	115	155	40 (135)	110	142	32 (129)	168	145
10	Passenger/Km	6.52	7.78	1.26 (119)	8.35	8.75	0.4 (105)	6.02	7.96
11	Average EPKM	14.5	33.69	19.19 (232)	21.5	33.52	12.02 (156)	36.75	28.82
12	Average CPKM (In Rs.)	24.5	30.5	6 (124)	24.5	30.7	6.2 (125)	30.3	30.5
13	MPKM (In Rs.)	-10	3.19	13.19 (1319)	-3	2.82	5.82 (582)	6.45	-1.68
14	Fare box recovery ratio	0.59	1.1	0.51 (186)	0.88	1.09	0.21 (124)	1.21	0.94

is that 23% of the passengers indicated that they earlier preferred walking; this in other words can be inferred as the mode available to them before introduction of these services was not affordable to them. There has been a reduction in the number of autos by 25%.

The immediate impact of the project has been a modal shift to the public transport system and reduction of vehicle congestion on the road. The introduction of city buses in the city has enhanced the rapport with the public sector organization. City bus services were equally praised by the public in general, their representatives and electronic media. There has also been a change in the attitude of the transport corporations across the state that even the operations of city buses can be viable. The success of these buses has led to fresh proposals for city buses under JnNURM, which has led to sanction of 329 buses for 10 cities in the corporation. Also a new SPV has been established to fulfill the obligations under JnNURM. Installation of ITS for all the buses sanctioned under JnNURM has been approved and the buses under operations now will also be brought under this system.

Financially too operations are viable in almost all the cities. The average fare box recovery ratio was 0.99. Barring Bellary and Koppal cities where the corporations are only able to recover the direct cost, all other cities have been operating with a marginal profit. Detailed pre- and post- introduction of bus services operation factors are illustrated in the following tables.

The HSD cost has been hiked many times after the project rolled off and the fares have been hiked twice during this period. One of the strengths of the project is that it is public centered. The fare structure, regular monitoring and acting upon the feedback from passengers, played a very significant role in keeping up with commuters' expectations. As an operating unit the corporation hardly has any role to play in other aspects such as development of roads and associated infrastructure, the enforcement mechanism and other regulatory measures which are complimentary for strengthening operations. In spite of these weaknesses, the project has stood the test of time and hopes to continue the same way.

Key Stakeholders and Roles

DULT, Bangalore provided the financial assistance (part funding) in procuring the rolling stock; CEPT University and Embarq, India provided technical assistance; City Municipal Corporation and Traffic Police provided the supporting infrastructure and enforcement respectively.

Enabling Environment and Barriers

The initiatives, assistance and the support extended by the DULT, Bangalore was one of the enabling factors that led to undertaking the project. A dedicated team with a determination to succeed throughout the implementation process also played an important role in the success of the project. The challenges encountered and their mitigation are discussed above.

Key Lessons, Continuity and Reliability

The results of the project have been better than envisaged during its planning stage. The success of the project has also inspired the proposal for more buses for these cities. A total of 329 buses, 4 bus depots and ITS for these vehicles have been sanctioned under JnNURM. In order to fulfill the conditions under JnNURM, a Subsidiary Corporation namely the North Eastern Karnataka City Road Transport Corporation (NEKRTC) has been created to monitor and manage the city services exclusively. Implementation of ITS for the existing buses as well for the new buses introduced under JnNURM will ensure the continuation of even better operations and closer management of the city services in future.

Contact details of concerned official

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ANY TIME RICKSHAW SERVICE: G AUTO

SNAPSHOT

Name	G-Auto
City	Delhi, Ahmedabad, Gandhinagar, Baroda, Surat and Rajkot
Duration	The project was started in February 2009 in Ahmedabad, August 2011 in Baroda, July 2012 in Rajkot, June 2013 in Surat and February 2014 in Delhi.
Current Status	The project has been executed in Delhi, Ahmedabad, Gandhinagar, Baroda, Rajkot and Surat.
Brief Description	G-Auto is the first project in India to provide an innovative solution to organising the auto rickshaw drivers under one common umbrella brand to offer safer and reliable services to customer and to improve the lifestyle of auto rickshaw drivers. It has been using mobile technology to offer 'call an auto service' at passengers' doorsteps at a Government approved meter rate.

PROJECT DESCRIPTION

Under the project auto rickshaws are made available at the consumers' doorstep through a dial-an-auto facility. G-auto promotes sustainable transportation and minimises the use of car for city travel. The enterprise also provides social security benefits such as death and accidental insurance, saving facilities, and education allowance for auto rickshaw driver's community. The project was started in February 2009 in Ahmedabad, August 2011 in Baroda, July 2012 in Rajkot, June 2013 in Surat and February 2014 in Delhi. It is now operational in all the said cities. Starting with 15 auto rickshaw, the foundation now supports and manages 10,000 auto rickshaws.

The broad objectives of the project are:

- 1) To ensure transparency and safety for passengers;
- 2) To ensure social and financial inclusion of auto rickshaws drivers and their family;
- 3) To make auto travelling a pleasant and passenger friendly transport system; and
- 4) To make auto rickshaw drivers aware and responsible citizens.

The project outlines with key features are:

- 1) Passengers' convenience - Transparency in fare, rickshaw available 24 X 7 through phone anywhere anytime in Ahmedabad, Gandhinagar, Baroda and Rajkot, facility to lodge complaint/suggestion through SMS, email, website, call center, exclusive booking counter at places like airport, railway stations, ST stand, free newspaper & magazine on rickshaw, city map available at rickshaws etc.
- 2) Auto Drivers' Welfare - Substantial increase in income, accident insurance upto Rs. 20,000, life insurance upto Rs. 1,00,000, cheaper medical facility with network of doctors, chemist and diagnostic centers, pension plan, additional earning through 'call an auto' service, educational allowance

to children of G-Auto drivers, ZERO balance bank account, and credit facility.

Strategic Intervention

With the help of a seed fund and office places provided by the state government, the project of G- Auto was started to provide last mile connectivity to a user living in interior or remote parts of the city through dial-an-auto facility (Mobile Technology). It has solved the problems of daily commuters by providing them these facilities. Its services are reliable, safe, very user friendly. Moreover, G-Auto drivers are well behaved, trusted for late night travel and reliable for picking guests from the airport or railway station in the city. In fact, G-Auto plays a pivotal role in cutting down trips by private modes and acting as a feeder service for existing BRTS services.

Type of Measure

The Government of Gujarat has provided offices at certain places along with the seed fund. The State Government contribution is Rs. 20,00,000 in phases. To make the project self-sustaining and scalable, Government of Gujarat has also given exclusive right to G-Auto for advertisement on its network of auto rickshaws in Gujarat. The total fund generation from the operation of G-Auto in 2011-2012 is around Rs. 20,00,000. The funds generated from the operation of G-Auto are utilised for the welfare and other activities of the G-Auto operations.

Implementation Process

G-Auto has developed its own smart mobile phone application that notifies booking to drivers, displays bookings at the display board, suggests recent and nearest booking, manages daily booking of drivers, sends SMS to customers with bill amount, and updates invoice status to G-Auto server. The foundation has developed a separate application for commuters to enable them

to book, call and track the vehicle. Commuters can also book G-Auto through website and call center.

Outcome

G-Auto has emerged as a solution to RATS (refusal, accessibility, transparency and safety) in auto rickshaws in the cities this facility operates in. Commuters do not any longer have to depend on the whimsical attitude of auto drivers. They have auto rickshaw available at just a call away. The G-Auto can also be booked through the mobile app or website which is popular with the youth. G-Auto drivers have been equipped with smartphones in order to facilitate the booking process. G-Auto has brought about major changes in the following three fronts of auto drivers' lives - Suraksha (Social and financial security through several welfare measures), Samriddhi (Prosperity by enhancing their income) and Sammann (Dignity for the profession) known as the three 'S' of G-Auto. The following have been some of the key benefits:

- A) Improvement in travel speed - Auto drivers are trained on safe driving and obeying speed limits. Hence the threshold speed is taken care of.
- B) Introduction of meter culture - Cities such as Gandhinagar, Surat and Rajkot that are not used to meters on auto rickshaw have now been able to book and avail the service of metered auto rickshaws within a few minutes of their requirements.
- C) Reduction in accidents - Since G-Autos are booked in advance to catch trains or flights, passengers do not ask rickshaw drivers to hurry up at the last moment. G-Auto drivers have met with only two accidents in the last one year.
- D) Reduction in greenhouse gas emissions - Since G-Auto run on demand through call, the dead mileage has reduced dras-

tically. Auto rickshaw drivers have realized this through efficient use of CNG in their vehicles. Since G-Autos run only on CNG, gas emission is very minimal. G-Auto drivers are the owner cum driver of the rickshaws and therefore take care of aspects such as use of the right quality of engine oil and maintenance of the vehicle which reduces gas emissions.

- E) Reduction in air and noise pollution - G-Auto keeps a check on maintenance of rickshaws for ensuring a good customer experience. A well maintained auto rickshaw makes lesser noise and emits lesser carbon. G-Auto encourages only CNG auto rickshaws to join the existing network. Therefore, the emission through G-Autos is lower compared to normal auto rickshaws.

Replicable Aspects of the Intervention

The project helps in controlling the law and order of the city. Auto rickshaw passengers are more vulnerable to overcharging, robbery and other crimes by auto rickshaw drivers. On the basis of the outcome of the project and the public response to the project, the project can easily be implemented in other cities also with the support of urban local bodies and through a community engagement strategy.

Source of Information

- Document submitted for the Award for Excellence in Urban Transport in 2014 to Institute of Urban Transport, India.
- Project details provided by:
Nirmal Kumar
Management Trustee
Nirmal Foundation
Email - mailing2nirmal@gmail.com

CATEGORY 2

TECHNOLOGY IN TRANSPORT

Intelligent Transport Systems (ITS) cover any technology applied to transport and infrastructure to transfer information between systems for improved safety, productivity and environmental performance. This includes stand-alone applications such as traffic management systems, information and warning systems installed in individual vehicles, as well as cooperative ITS (C-ITS) applications involving vehicle to infrastructure and vehicle to vehicle communications.

India, the second most populous country in the world, and a fast growing economy, is seeing severe road congestion problems in its cities. Building infrastructure, levying proper taxes to curb private vehicle growth and improving public transport facilities are long-term solutions to this problem. These permanent solution approaches need government intervention. The Government of India has committed Rs.234,000 crore in the urban infrastructure sector. BRT systems, metro rails and mono rails are being built in different cities to encourage the use of public transport. However still there is a steep growth of private vehicles. Some cities such as Bengaluru, Pune, Hyderabad and Delhi-NCR, with their sudden growths in the IT sector, have also shown a steep growth in population, further increasing transportation needs. Meeting such growth with infrastructure growth is seemingly infeasible, primarily because of space and cost constraints. Intelligent management of traffic flows and making commuters more informed about traffic and road status, can reduce the negative impact of congestion, though cannot solve it altogether. This is the idea behind Intelligent Transport Systems.

ITS in India, however, cannot be a mere replication of deployed and tested ITS in the developed countries. The non-lane based disorderly traffic with high heterogeneity of vehicles calls for the existing techniques to be adapted to the Indian scenario, before they can be used. Thus ITS in the Indian context needs significant R&D efforts.

Some inroads have been made nonetheless in the form of systems for traffic management, operational efficiency of public transport, and improved service for PT passengers in the form of passenger information system (PIS). In Mumbai for example, there is a system of centrally coordinated traffic signal using real-time data collected through detectors which helps to maximise traffic flow, reduce congestion and reduce in junction stops and delays to suit traffic conditions at different times of the day. Janmarg (Ahmedabad BRTS) has made very effective use of Intelligent Transportation Systems in order to constantly maintain the benchmark of operations and service quality. Efficient use of ITS provides high quality; reliability and rapid bus based mass transit system that is a first of its kind in India. In Mysore, KSRTC has introduced Real Time Passenger Information

System, in-vehicle display and automated voice announcement system, central control station, Automatic Vehicle Location system, Enterprise Management System etc. Taking cognizance of all such initiatives, the following list provides an overview of projects initiated by different agencies across Indian cities.

The **Mumbai Area Traffic Control** is a system of centrally co-ordinated traffic signals using real-time data collected through detectors which helps to maximise traffic flow, reduce congestion and in junction stops and delays to suit traffic conditions at different times of the day. Under the project 255 ATC signal junctions (Milestone I-53 junctions and Milestone II-202 junctions) were installed and two control rooms were established. The project claims a reduction in travel time, decline in delay at junctions, improvement in travel speed, reduction in accidents, better enforcement action, and savings in GHG emissions. The initiative has been elaborated in the form of a detailed project under the category of technology in transport.

The objective of the technology implementation plan was to identify and address all the systematic deficiencies within Traffic Management and Enforcement in a planned manner and with appropriate application of ICT tools. This was done through the formation of a traffic management centre which included creation of a unified, dynamic and user friendly interface for managing traffic signals, integrated complaint monitoring system, creation of a consolidated IT infrastructure, creation of a helpdesk, video surveillance cameras, Variable Messaging Systems, mobile communication, integration between multiple departments etc. **The Bangalore Traffic Improvement Project (BTRAC)** quantifies the reduction in travel time, improvement in travel speed, reduction in accidents, better enforcement action plan, and paperless enforcement of motor vehicles act for the first time in the country. The initiative has been included in this section as a snapshot.

S. No.	Name of the Project	Location
1	Mumbai Area Traffic Control System	Mumbai, Maharashtra
2	Bangalore Traffic Improvement Project (BTRAC)	Bangalore, Karnataka
3	Intelligent Transport System in Janmarg	Ahmedabad, Gujarat
4	CGRAPS	Pune, Maharashtra
5	Mysore Intelligent Transport System	Mysore, Karnataka

MUMBAI AREA TRAFFIC CONTROL SYSTEM

Brief Abstract

In 2002, the Mumbai Metropolitan Regional Development Authority planned to introduce a centralised ATC system in Mumbai. The World Bank funded project involved complete installation of Fully Adaptive Traffic Control (FATC) System comprising 253 signal junctions; a leased fibre optic transmission network; Traffic Signal Control Equipment and Adaptive Traffic Control System. The FATC System and Data Transmission Network Systems are to be fully integrated and centralised within the Traffic Police Headquarters Control Centre and in the Satellite Information Centre Room at the Mumbai Municipal Corporation Office.

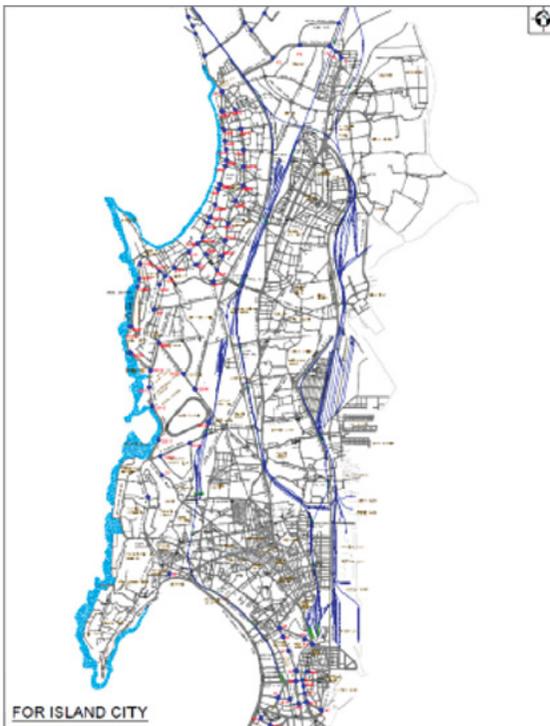
Background

MUTP, the multi modal project taken up by MMRDA, aims to bring about improvement in the current traffic and transportation situation in the MMR with the financial assistance of the World Bank. MUTP envisages investment in suburban railway projects,

local bus transport, new roads, bridges, pedestrian subways and traffic management activities. A major component of the project is the introduction of an ATC system in the island city of Mumbai which is implemented by the MCGM.

The ATC project was introduced in 1995 when the MMRDA took up the feasibility study of the implementation of a traffic responsive system for the island city. The work was awarded to M/s Pell Frischmann Consultants of United Kingdom. As part of the study, a pilot project was undertaken to check the effectiveness of the vehicle detection. Detector trials were conducted with the help of the traffic police, using the equipment of various leading players in the industry in the adaptive traffic market. The results were very positive and based on the recommendation, it was decided to take up the implementation of the project. The approval from the World Bank came in the year 2000 and the project finally went to the bid in 2003. As per the World Bank guidelines, fully adaptive ATC systems which have been working in other cities were eligible to be selected for imple-

➤ Milestone 1- 53 signal junctions



➤ Milestone 2 - 203 signal junctions

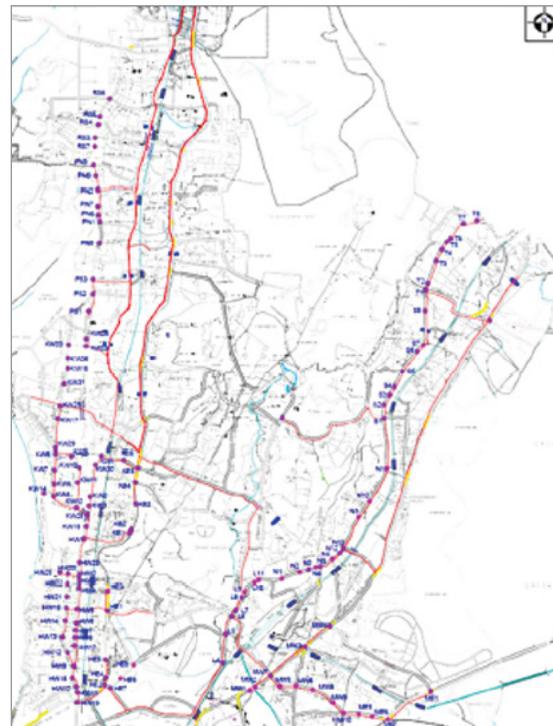


Figure 1: Phasing of Implementation of ATC System

mentation. Based on an international competitive bid, the joint venture of M/s Telvent Trafico y Transporte (Spain) and M/s CMS Computers Ltd (India) was awarded the work in 2007. The project was divided into two phases – Phase I (Milestone 1) comprising the pilot 53 junctions extending over an area between Haji Ali, Marine Drive & Regal Cinema and Phase II comprising a further 200 signals in the island city, eastern and western suburbs. These areas had been demarcated based on the severity of traffic congestion faced.

Need for the Project

The fast growing traffic condition in the city and lack of manpower deployment at various junctions in the city gave rise to the novel idea of introduction of ITS systems for the traffic management of the city.

Project Description

MUTP was taken up to improve the traffic and transportation situation in Mumbai. The Mumbai ATC Project is a part of Traffic Management component of MUTP. The Mumbai ATC project has transformed the conventional signaling system on city roads into a real-time computer controlled system.

The Mumbai ATC project covers:

- 253 signal junctions in Mumbai;
- A Central Control Room at Traffic Police Headquarters; and
- A satellite information centre at MCGM office.

The ATC project aims at infusion of modern technology as a systematic endeavour in Mumbai city’s traffic management. This is

coupled with the monitoring of CCTV cameras installed at the junctions on important corridors. The Mumbai ATC offers a great amount of assistance to regulate peak hour traffic as well as to handle traffic in unusual situations and circumstances. With the team of dedicated personnel in the control room working round the clock, it has definitely improved service delivery to the citizens of Mumbai.

MUTP, the multi modal project taken up by MMRDA, aims to bring about improvement in the current traffic and transportation situation in the MMR with the financial assistance of the World Bank. MUTP envisages investment in suburban railway projects, local bus transport, new roads, bridges, pedestrian subways and traffic management activities. A major component of the project is the introduction of an ATC system in the island city of Mumbai which is implemented by the MCGM.

Guiding Policy Document/Act/Notice

As a sequel to the Bombay Urban Transport Project (BUTP) which was completed in the year 1984 at a cost of about Rs. 39 crore, the MMRDA formulated a multi modal project viz. MUTP to bring about improvement in traffic and transportation situation in the MMR with the World Bank assistance. MUTP envisages investment in suburban railway projects, local bus transport, new roads, bridges, pedestrian subways and traffic management activities.

Project Implementation

ATC, as is known, is a system of centrally coordinating traffic signals using real-time data collected through detectors. This is an advanced tool in traffic management for efficient urban road

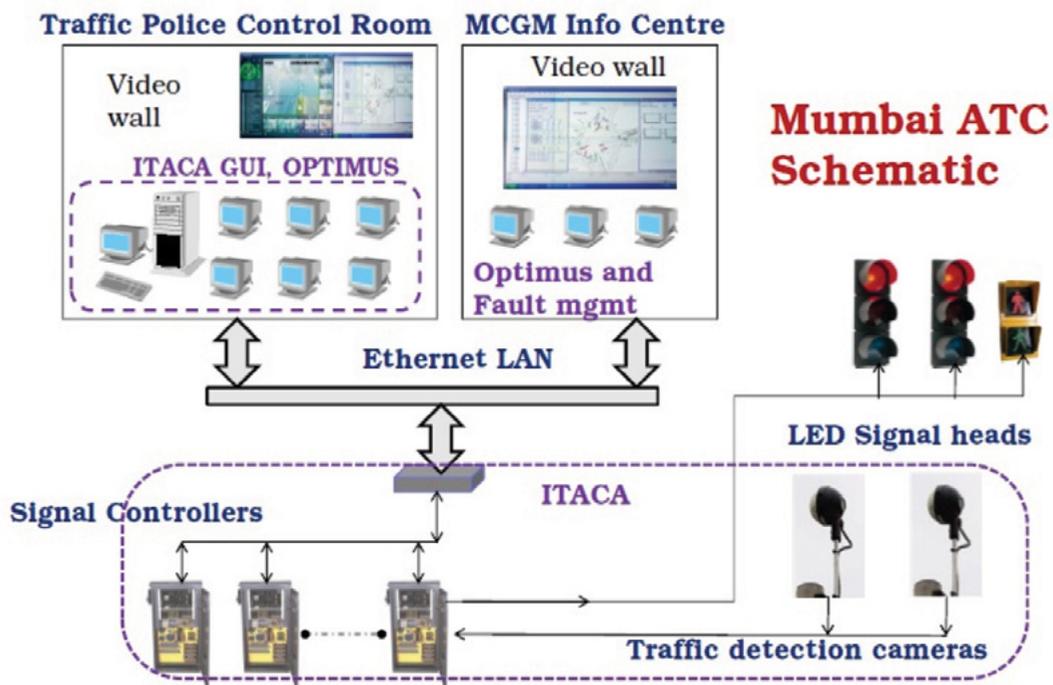


Figure 2: Schematic Representation of the deployed ATC System

network utilization. The components of the system procured for Mumbai include:

- Fully Adaptive ATC System which is a software in the control centre. The system which won the bid was ITACA (Intelligent Traffic Adaptive Control Area), developed and marketed by the Spanish company, Telvent Trafico y Transporte - now owned by Schneider Electric of France.
- As the street furniture was old, it was decided to replace all poles and signal aspects along with the signal controllers.
- Vehicle detectors.
- Leased Data Communication network from MTNL.
- Central Control Room at Traffic Police Head Quarters and Information Centre at MCGM Offices.
- Civil works including development of a fully ducted network which is expected to ease the maintenance process.

The implementation of the ATC system consisted of a number of stages - design, construction, supply and installation of equipment, system start-up, testing, training, and system maintenance. There were specific lessons learned in each of these stages. Whilst certain preventive measures were already in place, other techniques/methodologies needed to be developed and included in the overall implementation experience. The entire project cost of around Rs. 78 crore has been facilitated by the World Bank. The project requires an annual operations and maintenance cost of around Rs. 3.83 crore. The project is currently in operation. Maintenance contract has been awarded till October 2014 to Schneider Electric Infrastructure Ltd. for control room and vehicle detection and to CMS Computers Ltd. in two regions and Trafitek Pvt. Ltd. in one region for maintenance of street equipment.

Features of the System

The traffic controllers are capable of checking the detection data in every 0.01 second and transmitting it to the control centre every five seconds. The system stores the data at five minute intervals for every detector and also calculates flow, occupancy time and load.

The area can be divided into sub areas of junctions with similar traffic behavior. There can be unlimited number of sub-areas and

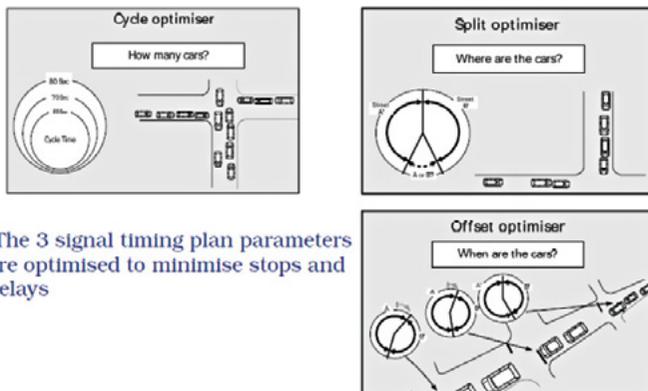


Figure 3: Features of ITACA System

these can be merged or further sub-divided as per the requirements. The basic three parameters of cycle time, green splits and offsets are optimised automatically by the system in order to minimise the stops and delays. The system, however, may not take short duration traffic surges as the calculations average out traffic over three cycles in order to avoid drastic changes in the pattern which may create confusion to the users. The success of any system will depend upon the level of calibration that is carried out. The conditions in Mumbai required extensive calibration of the lane capacities, mix of traffic and driving behaviour. Pell Frischmann Consultants, the engineers for the project, got directly involved in this through the contractor to help achieve the same in a faster and more effective manner.

Features of the Traffic Police Headquarters Control Room

- 3X3 Video wall gives integrated view of Surveillance cameras and the ITACA system GUI Optimus for better management.
- 25 Traffic Police personnel trained as operators, working in 3 shifts.
- Greenwaves can be implemented on VIP routes.
- Changes in various timing parameters possible.
- Junctions can be ordered in flashing manual mode.

Features of MCGM Control Room

- System generated alarms for status and malfunctioning are monitored.
- Maintenance System has been formulated so as to incorporate preventive and damage maintenance.
- Only monitoring of signal system, changes done from Traffic Police Control Room.

Innovations introduced

The implementation of an ATC system of this size has been done for the first time in India. The procurement specifications ensured that state-of-the-art technologies and equipment were brought into the city.

Signal Controllers: The controllers procured facilities for handling bus priority and emergency services in addition to the requirements of the ATC system. Over and above these, the following features were also incorporated.

Red Lamp monitoring: This is an in-built safety measure by which the controller will generate alerts for the loss of lamps, especially the red lamps. If more than one red lamp is lost on a particular approach, the signal will automatically go to flash mode. This ensures safety of the road users as there could be confusion to the drivers if the red lamps are not visible or lost.

Night Time Dimming: The new signal aspects are very bright for better visibility during the day time. However, at night, the controllers can automatically dim the lights, which reduces the energy consumption.

Overhead Video Detectors: Though initially the project was implemented with inductive loops, the same was changed to overhead detectors using video technology. Accordingly, nearly 800 camera detectors are being used in the city. Supplied by

Belgium based Traficon N V, the detectors are flexible as one camera can manage four traffic lanes and the detection area can be modified based on the site requirements – a definite advantage in Mumbai where three lanes handle almost four lanes of moving traffic. These cameras are very small in size and are located 7 to 10m above ground and as a result, are not prone to damages to the loops. The last batches of the cameras (about 500 nos.) are capable of mpeg-4 video streaming as well.

Single Source LED aspects: Mumbai has been using arrays of LED lights for traffic signals for some time now. However, the damaged LEDs in the array present an unpleasant sight to the road users. As part of this project, single source LEDs (which have 6 or 7 LEDs only) were used. The lower number of LEDs used per aspect has reduced the total power consumption which is a direct saving to the city.

Signal Poles: Signal poles were made of galvanised iron with PU coating which is resistant to rust without the need for regular paintings. The termination of the wires is provided at the top of the pole (located within the pole) which has eliminated the vandalism of the signal system – one of the most common problems in the city. The cantilever poles were designed in a sleek manner so that these do not become a visual obstruction

on the street even while being extended to the middle lanes of the traffic. The visibility of the signals is one of the most talked about points by the road users. Also, the cantilevers are designed in such a way that when the Ganesh procession (during Ganesh Chaturthi) or any such activity takes place, they can be swung off the traffic lanes facilitating unrestricted movement.

Pedestrian Push Buttons: In order to introduce demand based pedestrian signaling at some of the intersections, pedestrian push buttons are introduced. This was introduced with audible signals for everyone’s use.

Fully Ducted Network: This was done on the recommendation of the consultants to avoid frequent digging which happens for many other utilities in the city.

Training: As part of implementation, extensive training (theoretical as well as on-hand) was carried out for the users including the engineers and officers of MCGM and the Traffic Police personnel. On-the-job real-time training too was provided. As a result, the system is under use by these personnel, independent of the system providers.

Maintenance Monitoring: The system also has a module for monitoring faults and repairs. These are routinely used to evaluate the performance of the maintenance contractors.

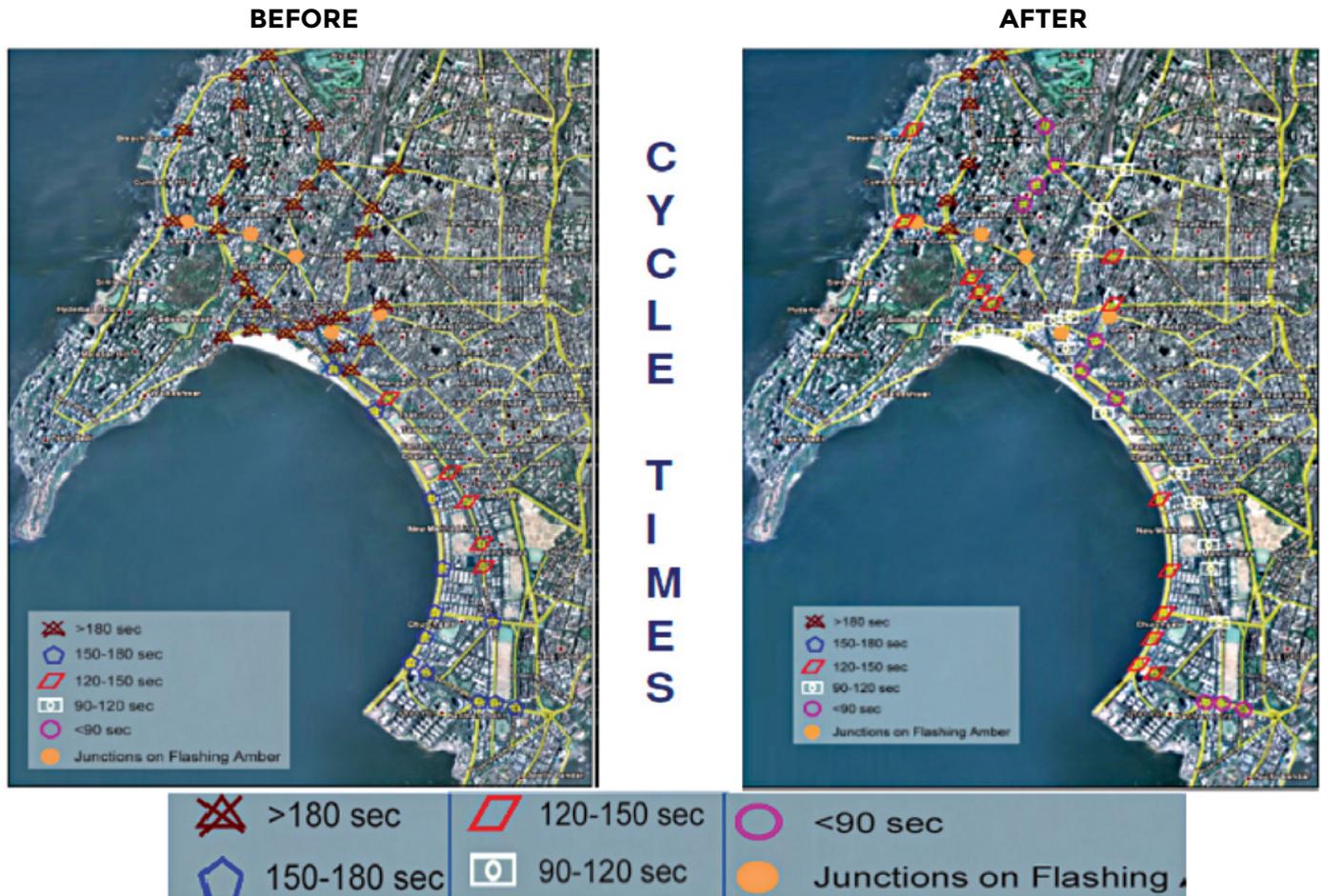
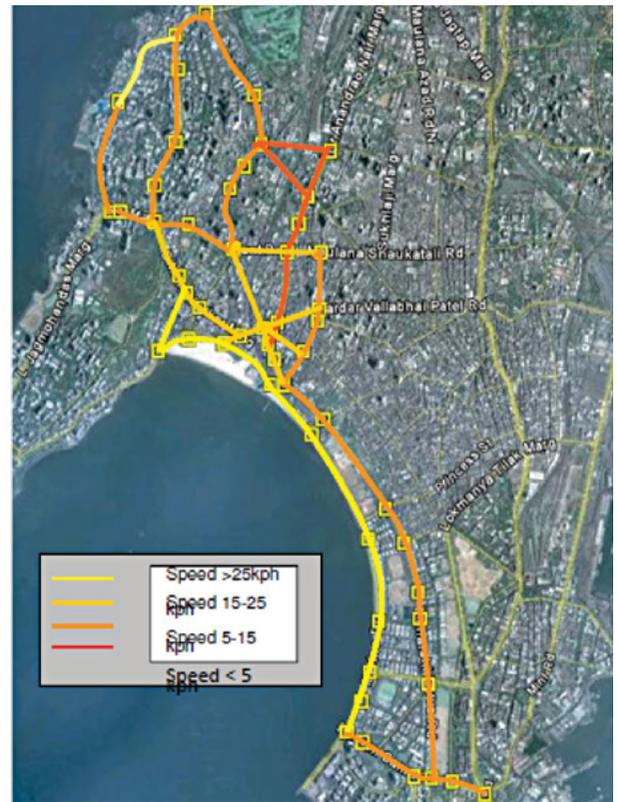


Figure 4: Comparison of Cycle Times along Marine Drive

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Figure 5: Comparison of Journey Speeds along Marine Drive

TABLE 3: RESULTS OF SPEED AND DELAY STUDIES CONDUCTED ON MARINE DRIVE

Speed & Delay Studies					
Average Journey Time (Minutes)					
		Morning	Afternoon	Evening	Average
Marine Drive	North bound (Before)	4.57	5.17	6.99	5.58
	North bound (After)	4.34	4.74	6.3	5.13
	Reduction in Delay	0.24	0.43	0.69	0.45
	Percentage Improvement	5.15%	8.35%	9.91%	8.12%
	South bound(Before)	6.81	5.52	6.82	6.39
	South bound(After)	6.2	4.93	6.52	5.88
	Reduction in Delay	0.61	0.59	0.3	0.5
	Percentage Improvement	8.97%	10.77%	4.46%	7.88%
Length of the Corridor: Marine Drive-3.9 km					
20 Rounds of Survey done over a period of 10 days in the “before” and “after” scenario					
Method: Moving Observer Method					

TABLE 4: SIGNAL TIME SURVEY RESULTS FOR MARINE DRIVE

Details of Results for Marine Drive									
Comparison of Cycle Times(in Seconds)									
	Region 11-1		Region 11-2		Region 12		Region 10		
	Marine Drive		Air India,LIC		Mantralaya		Marine Drive		
	Jn-44,45,46,47		Jn- 48,49		Jn-50,51,52		Jn-1,2,3,4,5		
	Before	After	Before	After	Before	After	Before	After	
8am -9am	120	85	120	85	120	85	140	80	
9am -12pm	150	130	150	100	150	85	170	115	
12pm-5pm	150	130	150	130	150	90	140	100	
5pm-8.30pm	140	120	140	115	135	85	160	115	
8.30pm-10.30pm	110	100	100	95	100	85	150	100	

Results and Impacts

The major benefits of the system include:

- Reduction of Signal Cycle time (180 sec average to 120 average);
- Improvement of speed - About 10% increase in traffic speed in the Milestone-I region;
- Reduction of stoppage delay on the network about 17%; and
- Energy saving of about 30-40% due to reduced power consumption of LED signal heads as compared to the incandescent signal heads.

The implementation of the ATC system has brought about some benefits to the road users. Pell Frischmann Consultants conducted detailed studies and carried out analysis including the modelling of before and after scenarios, actual traffic counts and speed & delay studies to determine the effectiveness of the system. The major findings are as follows:

The implementation of the system has realised a significant reduction in the cycle time in a majority of the regions - this reduced from 18 sec to 12 sec, except in the area around Kemps corner which is one of the most complicated junctions. Speed & delay studies revealed de-congestion of some of the slowest moving sections such as the Income-Tax Office (D Mulla Road Junction) and Churchgate areas. Further improvements in some of these areas could be achieved by enforcement of strict parking norms and lane discipline. As per World Bank estimates, the likely achievable savings in delay were estimated at around 660 Passenger Car Units-Hr/Hr. The studies revealed that the actual savings have been much high at around 1300 PCU-Hr/Hr for the peak hours. The annual savings translate to huge values, roughly estimated to about 1.8 million litres of fuel. Apart from this, the improvement in speeds in various regions is in the scale of 5%-10% at peak time and go up to 30% at off-peak time. Economic Internal Rate of Return (EIRR) on the project (without considering time savings) has worked out to about 63% compared to the previous situation. Analysis has revealed that even if the previous setup was optimised, an EIRR to the tune of 19% could

have been seen in the city. There was skepticism on the possible success of the project, especially since the effectiveness of ATC systems is limited in over saturated conditions. But owing to the long cycle times being used in the city, the impact of optimisation could be clearly observed.

Key Stakeholders and Roles

The project is funded by the World Bank. The nodal agency is MMRDA and the project is being implemented by Municipal Corporation of Greater Mumbai and the Mumbai Traffic Police. Technical support was provided by Pell Frischmann Consultants and the contractors Telvent Trafico y Transporte S.A-CMS Computers.

Enabling Environment and Barriers

- Factors limiting the performance of the ITACA system include:
- Traffic is not lane following;
- Side roads and on street parking;
- High mix of traffic; and
- Instances of Communication Network Failure.

This was one of the most challenging jobs in the city which created over 68 km of fully ducted network with inspection/maintenance chambers. The project used up around 100 km of signal cables, 2,000 signal poles and 500 cantilever poles. This included unavoidable civil works which led to several problems. Ever since the implementation process of the project started, delays also crept in - some of which were anticipated and some new. According to PRK Murthy, Chief, Transport and Communications Division, MMRDA, lack of lane discipline and the parking of vehicles on the left side of the roads were two significant problems.

Traffic: During the day time, no work is possible on Mumbai streets due to the high traffic movement through the saturated network. Based on the discussions between MCGM and the Traffic Police, it was decided that the only feasible time to work

on the streets is night time, that too starting after 10 pm.

This was acceptable in the areas with activities of commercial nature, but brought stiff resistance from residential areas due to the possible noise levels from the work. The MCGM stepped in and the Addl. Municipal Commissioner wrote personal letters to all residential societies about the work and requested them to cooperate with the Contractors. Also, MCGM officers were present throughout the night at the work site to ensure that the work did not get stopped. Despite all good efforts, there has been opposition wherein the Contractor was forced to work only for a small period of time in order to maintain a peaceful atmosphere.

Utilities: As part of the contract, a fully ducted network using highly durable double walled corrugated HDPE pipes was to be installed under the footpaths and at places where road crossings were required. This proved to be a major challenge as the footpaths were full of utilities laid in a haphazard manner. In the absence of any documented utility information, the only solution was to carefully proceed to open up the area and lay the new ducts. The density and diversity of the utilities needed extreme care on the part of the contractor and supervising team to select the path of the new ducted network. This was a time consuming exercise, but was unavoidable.

Loss of Loop Detectors: Initially, the project had inductive loop detectors that were embedded within the road surface. Within one month of installation, about 30% loops were damaged by various other agencies carrying out works on Mumbai's streets. The attempts to reduce these damages proved futile and the overhead detectors using video technology were brought in.

Multiple agencies involvement: Many agencies were involved in the implementation. This included the implementing agency

MCGM, the end user Traffic Police, the nodal agency of MMRDA, several utility companies and other infrastructure developers (mono rail, metro etc.). The co-ordination of all these agencies posed several challenges. Special VVIP movements required work to be stalled before or on the days of the movements, MCGM does not allow work during Mumbai monsoons (from the end of May to the end of September) and exodus of labour force. The fact that the ATC work had to be carried out at night with frequent stoppages was also a challenge.

Key Lessons, Continuity and Replicability

At present there are 1,200 junctions that need to be signalized. MCGM has planned to upgrade a further 300 signals to the ATC system by 2017. The expressions of interest for the same have already been invited. This project was a tough learning experience for everyone involved in the implementation. In retrospect, the combining of so much civil work with a traffic signal system contract led to some problems during implementation that would have been avoided with separate contracts. The calibration of each signal site is something that needed to be carefully done and the time taken for the same in Mumbai has been phenomenal due to its peculiar traffic conditions.

Contact details of concerned official

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BANGALORE TRAFFIC IMPROVEMENT PROJECT

SNAPSHOT

Name	Bangalore Traffic Improvement Project
City	Bangalore, Karnataka
Duration	2006 - 07
Current Status	Ongoing
Brief Description	B-TRAC is a “first of its kind” project in the country to address the issues of traffic congestion, safety etc. by utilising the latest traffic management technologies and techniques. This will give the much-needed scope for large infrastructure projects to be planned and implemented for improving the transportation system in Bangalore city.

Project Description

The past decade has seen phenomenal growth and expansion of Bangalore city. The population of the city has grown by 38% in the past decade, and the number of vehicles has grown by around 10% per annum. Known as the Silicon Capital of the country, the city has not kept pace with these growth levels. To be able to counter this rapid expansion and congestion, the Bangalore Traffic Improvement Project or B-TRAC has been implemented. The project displays use of technology with the aim at providing safe, efficient and comfortable travel to the residents of Bangalore. Bangalore has approximately 11,000 km of road catering to 40,00,000 vehicles and 44,000 intersections. There are currently more than 330 signalized intersections and 128 one-way roads in the city.

Some of the traffic indices for Bangalore are given below.

The major problems Bangalore city is experiencing are as follows:

- Phenomenal growth in vehicular traffic;
- Traffic congestion and bottlenecks;

- Road accidents leading to deaths and traumatic injuries;
- Air and noise pollution;
- Poor Urban Traffic Planning;
- Zero Parking Infrastructure; and
- Indiscipline among road users.

This 5-year programme will cost about Rs. 350 crore. For the financial years 2007-08, 2008-09 and 2009-10, the Government has released Rs. 44 crore, 35 crore and 40 crore for the programme respectively. In the year 2010-11, Rs. 5 crore is planned to be released. The implementation will be done by the Govt. owned Karnataka Road Development Corporation (KRDCL). The objectives of B-TRAC 2010 are two-fold:

Indices	Year 2011	Year 2008
Congestion Index	0.45	0.33
Travel Time Index (TTI)	1.69	1.57
Road Safety Index (RSI)	0.079	0.047

Source: Bangalore Mobility Indicators



Figure 6: Traffic Congestion in Bangalore

Operational Objectives	Institutional Objectives
<ul style="list-style-type: none"> • Reducing traffic congestion by 30% in central area • Reducing pollution • Reducing accidents by 30% • Improving parking management • Setting up accident reduction and trauma care system 	<ul style="list-style-type: none"> • Co-ordinated and planned traffic management • Robust revenue model based on traffic fines • Legal and institutional reforms • Capacity Building - modern Traffic Training Institute • Strengthening of traffic police by augmenting infrastructure

FIGURE 7: COMPONENTS OF B - TRAC



Strategic Intervention

Bangalore city has witnessed a phenomenal growth in vehicle population. As a result, many of the arterial roads and intersections are operating over the capacity (i.e., v/c is more than one) and average journey speeds on some of the roads in the Central Area are less than 15 kmph at peak hours. Therefore, it became necessary to plan for efficient traffic management in Bangalore. In this regard, the Bangalore City Traffic Police envisaged the “Bangalore Traffic Improvement Project” or B-TRAC 2010.

Type of Measure

B-TRAC 2010 is a first of its kind project in the country to address the issues of traffic congestion, safety etc. utilising the latest traffic management technology. The project is aimed at complementing the efforts of other agencies to upgrade the road infrastructure and develop an efficient mass transportation system.

Implementation Process

B-TRAC was envisaged by the Bangalore Traffic Police to address the ever growing traffic operational needs of Bangalore City Traffic. The Bangalore City Police obtained the approval for this project from Government of Karnataka vides G.O. HD: 73: POP: 2006 dated 22/5/2006 to initiate immediate steps for traffic improvement in Bangalore City. The first tranche of grants was released and Bangalore City Police in turn signed a Memorandum of Understanding (MOU) with KRDCCL, a special purpose vehicle to implement the project on its behalf. The B-TRAC project is divided into five phases covering a time period of five years starting with 2006-07.

Outcomes

The impact of B-TRAC has been:

- Transparency in enforcement of traffic rules and substantial

compliance of traffic laws and rules (number of cases registered and total fine amount collected has increased by 3 times between 2007 and 2010);

- Reduction in road crashes (18% reduction in road crashes between 2007 and 2010);
- Reduction in traffic congestion in central area (average savings in time of 15% achieved for 80% of the junctions);
- Reduced journey time due to signal synchronization (average peak hour speed improved from 18 kmph to 23 kmph).

Replicable Aspects of the Intervention

The problems of metro cities with growing traffic congestion are similar. There are multiple ongoing initiatives which aim at promoting sustainable transport system like MRTS and NMT. City planning requires integrated planning solutions catering to the different modes of transport and needs of the residents. Technology can play an integral role in this. The success of the B-TRAC project lies in its optimal use of technology for providing solutions to the traffic and transport problems of the city. Other Metro and Tier-II cities should adopt the learnings of Bangalore and try and resolve their traffic problems. The first step could be to adopt standardization of road signs and markings in any city. A medium to long term solution would be to establish a Traffic Management Centre which would help in installing signal synchronization, surveillance cameras etc.

Source of Information

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CATEGORY 3

INCLUSIVE TRANSPORT

The availability of transport services for the poor, women, persons with disability and the elderly has emerged as an important issue in the context of a number of transport policies with change in focus to equitable distribution of resources and facilities. It requires the removal of institutional and physical barriers as well as special consideration during the planning process to the differences in accessibility as well as needs of each group of users especially the disadvantaged ones. One of the policy level changes can be enhancement of incentives to increase accessibility to transport opportunities for diverse individuals and groups.

A few such initiatives in this context are - the Delhi Metro, which has not only priced its service almost at par with the bus system, but has provisioned for complete accessibility to differently-abled people, has a separate coach on each train for women passengers (safety), has seats reserved for senior citizens, is completely monitored by close circuit cameras to prevent anti-social activities, and has a huge force of security personnel. All these measures combined, have tremendously increased mobility of those sections of the society that were erstwhile forced to limit their mobility (latent travel demand) due to lack of infrastructure. Another example is the revamping of bus related infrastructure (buses and bus shelters) in Delhi to make it accessible to the differently-abled. Similar initiatives have been identified and included in the list below.

The **Alwar Vahini project** has gained significant attention since its operation started in December 2011. The attractive vehicles carry more than 100 thousand passengers every day, especially from the weaker sections of the society. As these vehicles are becoming more and more popular within the city, private vehicle usage has reduced considerably and provided benefits like reduced pollution and congestion, thus making the city more livable. The following section would elaborate this initiative in detail.

With the vision “embrace the ideals of all people living together

harmoniously in a barrier-free world without fear of exclusion and non-discrimination”, initiatives undertaken by Samarthyam: National Centre for Accessible Environment are worth emulating. By undertaking comprehensive audits of existing transport infrastructural services, this agency has propagated design interventions in favor of the differently-abled and vulnerable users. Inclusive and Universal Design has resulted in more passenger inflow, less travel time and added revenue generation for the service providers. Its reliability, affordability and comfort have attracted people using private modes of transportation. It would also result in increased education and employment opportunities and the integration of Persons with Disabilities (PwDs) into the mainstream society. These efforts are recorded in this section as snapshot two details.

S.No.	Name of the Project	Location
1	Access Audits of Delhi Metro Infrastructure	Delhi
2	Alwar Vahini: Mini passenger public transport service in the city of Alwar in India	Alwar, Rajasthan
3	Organising the Cycle Rickshaw Industry: Case study of Sammaan Foundation's work in India	Bihar, Jharkhand, Uttar Pradesh, Madhya Pradesh, and National Capital Region
4	Access Audits Of Bus And Bus Shelter As A Part Of Promotion Of User-Friendly Pt Systems In Delhi - Implementation Strategies	Delhi
5	Ahmedabad BRT System: Reviving mobility in low income neighbourhoods	Ahmedabad, Gujarat

ALWAR VAHINI

Abstract

Like many of the small and medium size cities, Alwar also had an informal public transport system operational through the means of shared auto-rickshaws, vikrams, tempos etc. which are highly polluting, totally unorganized, unsafe and passenger unfriendly. In order to tackle these problems, initiatives undertaken by the administration of Alwar city should be given due cognizance. The city authorities have shown the way forward by launching a project called "The Alwar Vahini" on 3rd December, 2011. Alwar Vahini is a passenger service (Euro IV compliant vehicles for about six to seven passengers) which has replaced the old polluting autos, tempos and vikrams with the joint efforts of various organizations such as Regional Transport Office, Lead Bank (Punjab National Bank), Urban Improvement Trust-Alwar, Urban Improvement Trust-Bhiwadi and Deputy Registrar Co-operative with the District Administration playing the coordinating role.

Background

There was no city bus service in Alwar. The city's transport needs were being catered to by 750 three wheeler tempos and autos. These were found to be unsafe and uncomfortable. However, the absence of an alternate mode left the residents with very little choice. The routes of operation for these autos were not based on any demand study and were left at the discretion of the operator. This resulted in some of the residential, commercial and industrial areas being poorly connected. Thus, there was a need to provide an immediate solution to the transportation needs of the residents of Alwar. Given the size and population of Alwar, any MRTS or BRTS operations seemed unviable.

Need for the Project

Alwar city with a population of 3.6 lakh is one of the most rapidly growing urban areas of the NCR. The burgeoning growth of the

industrial base of Alwar district (population 38 lakh) has been matched by a rapid growth of its residential and commercial areas. This has placed a great strain on the existing infrastructure of Alwar. The cities of Alwar and Bhiwadi had clear cut commercial, industrial and residential areas with poor interconnectivity.

This infrastructure gap was most acutely felt in the public transport sector with a lack of an efficient means of public transport. The most prevalent means of public transport till recently had been three wheelers in the form of auto rickshaws, vikrams and tempos. A majority of these were more than a decade old and in very poor mechanical condition. These three wheelers were noisy, polluting, overcrowded, uncomfortable and unsafe. Also, they were generally shunned by women, the elderly and children.

Due to the medium size of the town, a metro system or a BRTS would have been unviable. Even a city bus service would not have been viable due to the lack of sufficient passenger traffic spread out throughout the day. Also, Bhiwadi with a population of 1.10 lakh is one of the fastest growing urban centres in the country and despite its rapid development the state of public urban transport in Bhiwadi was nonexistent. To deal with this issue, Alwar Vahini was launched in Alwar with 58 vehicles on 3rd December 2011.

Project Description

Alwar Vahini is a passenger service of Euro IV compliant Tata Magic and Mahindra Maximo vehicles which have replaced the old autos, tempos and vikrams. The Alwar Vahini Project has been a joint effort of various organizations such as the RTO, Lead Bank (Punjab National Bank), UIT Alwar, UIT Bhiwadi, and Deputy Registrar Co-operatives with the District Administration playing the coordinating role. Key principles of this scheme are as follows:

- Harness the entrepreneurial energy of the youth;



Figure 8: Old Tempos in use in Alwar



Figure 9A: Alwar Vahini

- Plan, regulate, manage and encourage;
- Involve citizens and give them pride of ownership of the project; and
- Don't spend Government funds directly instead spend on support infrastructure.

Salient features of this innovative scheme are as follows:

- The Alwar Vahini project is almost completely funded from private bank loans with the District Administration only playing a coordinating and facilitating role.
- The time from the conception of idea till the launch of the project was about two months.
- The project has a very high visibility quotient. The attractively painted vehicles carry thousands of passengers every day and are seen by all other commuters on the road. Introduction of hundreds of these attractive vehicles radically transforms the 'feel' of the town.
- There is a great increase in the overall satisfaction levels of commuters who perceive Alwar Vahini to be a modern, fast and respectable means of transport.
- Every Alwar Vahini vehicle has a unique number prominently displayed. This helps in easily identifying the vehicle if any sort of traffic violation has been made. 15 high resolution CCTV cameras provide an over-watch to ensure that the highest standards of discipline are maintained.
- One of the aims of the project is to reduce the congestion on roads caused by private vehicles. Surveys among two and four wheeler users had clearly indicated that they are willing to shift to Alwar Vahini provided the service connects their origin and destination and is timely. As Alwar Vahini vehicles have become pervasive throughout the city, private vehicle usage has reduced and provided benefits like reduced pollution and congestion, thus making the city more liveable.
- A constant demand of representatives from many areas is for the opening of RSRTC routes in many areas. In a majority of cases, this is not possible due to viability constraints. Hence, a lot of areas went un-serviced. Alwar Vahini stepped in to provide the means of catering to this unmet demand and also providing employment to youth.
- Stress has been laid on the seemingly small but significant details with a lot of emphasis on driver behavior and etiquette. The motto of "Samman our Sewa" (Respect and Service) has been the guiding principle.

Guiding Policy Document/Circular/Notice

Directives have been issued by Ministry of Urban Development, GoI to all the states/urban agglomerations to plan and improve the public transport services in their jurisdictions. Letter no. K-14011/4/2009-UT (Pt.) dated 6th December 2010 is one such initiative undertaken by MoUD to direct states/UTs to improve urban transport services. After the successful implementation of this project, another advisory (D.O. No. K-14011/1/2013-UT-I dated 14th January 2013) has been issued by MoUD, GoI to all other cities to emulate similar initiatives.



Figure 9B: Alwar Vahini

Project Implementation

At present, 1,310 Alwar Vahini vehicles have been launched. It is projected that the total requirement would be for about 2,200 vehicles in the entire district. The following provides a snapshot of existing services in the city:

- Alwar Vahinis have been launched on 1,310 vehicles (projected 2,200) in the entire district;
- Three wheelers replaced: 720;
- Independent market survey shows extremely high levels of satisfaction among citizens;
- Government expenditure: Nil;
- Individual private expenditure (through bank loans): Rs. 48 crore;
- A Mahila Alwar Vahini with woman drivers launched on 26th January 2012;
- A website www.alwarvahini.com launched on 1st January 2012 so that citizens would get complete information about the routes serviced;
- As a part of the composite traffic management plan, 50 cycles purchased to be stationed at various parts of the city so that they can be used by commuters for a nominal fee and then returned; and
- The routes are classified as per the area in which these services ply. There are three categories of services, namely Urban Services, Rural/Gramin Seva and suburban services. At present there are 26 urban routes and 68 rural routes. Authorities are planning to initiate suburban services to promote connectivity to peri-urban areas in the future.

Support Infrastructure Development: A holistic approach has been undertaken to ensure a well-managed traffic situation in the city. Towards that end, the following measures have been taken:

- Construction of 20 modern bus stops similar to those in Delhi;
- Installation of 25 high resolution CCTV cameras throughout the city;
- Construction of a modern Police control room;
- Widening of main city thoroughfares (67 km in total underway);
- Erection of 45 High mast lights;
- Beautification and reengineering of 5 city roundabouts;

- 1040 signages installed throughout the city on the New Delhi pattern;
- 6 city entry gates with traditional Rajasthani architecture;
- Reengineering of all T-junctions, which are accident-prone, and construction of slip lanes;
- 4 New ROB's which have been approved by the Government;
- Installation of collapsible traffic management gates;
- Installation of police watch towers.

Results and Impacts

This innovative concept has been applauded not only by the Government but several other multi-lateral agencies such as the World Bank. The major impacts of the scheme are highlighted below:

- As a part of the project, the District Government introduced an attractive exchange programme for three wheeler owners. The idea was to first provide an opportunity to the people already engaged in public transport service to upgrade to a newer and better means of transport. As a result, around 720 vehicles were exchanged and scrapped under this scheme over a period of one year. Additionally, incentives such as loan facilities at reduced interest rates from nationalized banks and financial institutions helped in the easy purchase of the new mode. Also, arrangements were made to ensure documentation of all formalities (including vehicle insurance, RTO formalities, route permits and others) under one roof, once at the time of purchase of the vehicle.
- To enhance livelihoods for women and provide secure travel options to women commuters, Mahila Alwar Vahini was launched in January 2012. Vehicles under this scheme

have lady drivers and follow a special light red colour scheme, which allows easy identification. Here, the word Mahila literally means woman. This service has lady drivers and is particularly aimed at offering safe and comfortable commuting services to the women in the city.

- As these vehicles are becoming more and more popular within the city, private vehicle usage has reduced considerably and provided benefits such as reduced pollution and congestion, thus making the city more liveable.
- With zero investment on the part of the Government, the project brings in additional revenue to the Government from permit fees and taxes.
- It has employed more than 3,000 persons directly and many more indirectly. The project has the potential of quickly transforming the public transport scenario with minimum investment from the Government. At the same time, the scheme not only creates employment opportunities but also benefits the society at large by providing a systematic public transport system.

Key Stakeholders and Roles

As mentioned the Alwar Vahini Project has been a joint effort of various organizations such as the RTO, Lead Bank (Punjab National Bank), UIT Alwar, UIT Bhiwadi, and Deputy Registrar Co-operatives with the District Administration playing the coordinating role. The roles and responsibilities of each stakeholder involved in this project are outlined below.

- **Bank:** The lead bank of the district, Punjab National Bank was approached to be the principal banker for the project. PNB agreed and also launched a special scheme with the approval



Figure 10: Support Infrastructure developed by UIT

of the PNB HQ. Under this scheme, the rate of interest was reduced to 14.25% with an extended payback period of 5 years. It was also planned that no collateral would be taken from the applicant and the government would act as the guarantor under the CGFTI -Credit Guarantee Fund Trust of India scheme. PNB also fast tracked all the applications for loans and has been disbursing loans through a special team set up for the purpose.

- **RTO:** The RTO office has been responsible for allotting the route permits to the Alwar Vahini applicants. The RTO has also been keeping a regular field vigilance team to ensure that all passenger vehicles ply as per the government norms.
- **UIT:** UIT Alwar and Bhiwadi have borne the cost of providing Uniforms, ID cards, Group Insurance and soft skills training of the drivers. The UIT has also built the support infrastructure in the form of modern bus stops, signages, high mast lights, traffic signals, CCTV traffic monitoring cameras and an advanced police control room.
- **Tata Motors, Mahindra & Mahindra:** Dealerships of both companies have given very sizeable discounts and have also borne the expenditure of pasting stickers on the vehicles. Both companies acknowledged that this was a one of a kind project and deputed their respective teams from the corporate HQ to study the implementation details of Alwar Vahini for replication in other places.
- **Alwar Vahini Co-operative Society:** A co-operative society was formed comprising Alwar Vahini owners in order to ensure that common benefits such as insurance be provided to the members. All members had to undergo a free annual compulsory medical check-up which involved physical fitness, eyesight check etc. The office bearers chosen by the society acted as the contact persons so that administrative orders could be conveyed to all members through the co-operative society. To engender a feeling of belonging to a close knit group and build up a unique group culture of “samman our seva” - which is the motto of Alwar Vahini, regular meetings and get-togethers were held.
- **NGO specializing in soft skills training** has been engaged for training the drivers in etiquette and driving discipline. Attention is being given to small but significant details such as keeping the vehicles clean and well maintained, always being smartly dressed in uniform and addressing all passengers respectfully.

Enabling Environment and Barriers

As discussed earlier, strong political will and motivation to improve the existing transport services in the city of Alwar lead to introduction of this innovative scheme. The District Administration played a vital role in setting up this systematic public transport system in the city. Organizations from every sector joined hands to promote this scheme, which not only focuses on improving the mobility of urban populace but also improving the livelihood of the service operators and their families. The system has also faced several challenges since the inception stage itself. Some of these are discussed in detail below.



Figure 11: Workshop to promote the concept

1. The biggest roadblock at the beginning of the scheme was encouraging existing operators to join this scheme. Since these operators belong to the lower income groups, it was quite difficult to convince them to join the scheme. Numerous counselling sessions and workshops were undertaken to attract operators to convert their vehicles to the new Alwar Vahinis.
2. The service also faced stiff competition from other modes of transport which operate in the city. Some flyovers and RoBs are under construction in the city of Alwar. Because of the road-blocks created by such construction work, long distance buses which were earlier not allowed inside the cities were now forced to detour and operate inside the city. This operation led to shifting of passengers from Alwar Vahini to long distance buses.
3. Another problem faced by this scheme was deployment of more number of vehicles on each route. At the inception stage, a rough estimate was prepared to issue permits to an approximate number of vehicles operating on each routes. This led to accumulation of higher number of vehicles on the existing routes than required. There are instances where many of these vehicles were simply parked across the city throughout the day because of less or negligible ridership present on some of the existing routes. This further led to problems such as inability of the operator to repay the loan amount leading to impounding of vehicles by banks in certain cases.

Key Lessons, Continuity and Replicability

Alwar Vahini is a model worth emulating in all cities, especially small and medium size cities to act either as a public transport system or act as the feeder system for other high capacity systems such as city buses, BRTS, MRTS etc. to make the system more safe and passenger-, as well as operator- friendly.

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ACCESS AUDITS OF DELHI METRO INFRASTRUCTURE AS A PART OF PROMOTION OF USER-FRIENDLY PT SYSTEMS IN DELHI - IMPLEMENTATION STRATEGIES

SNAPSHOT

Name	Access Audits of Delhi Metro Infrastructure as a part of Promotion of user-friendly PT Systems in Delhi
City	New Delhi
Duration	Access Audits of the Delhi Metro stations started from inception of the first station - Welcome Station in 2002 and is still ongoing with each new corridor/stations that are coming up
Current Status	Delhi Metro has started including the recommendations of the audits in all upcoming stations. Retrofitting is also undertaken in an existing station.
Brief Description	The initiatives by Samarthyam involve evaluation, development and promotion of universal accessibility in built and outdoor environments, transportation systems etc. The foundation has undertaken rigorous accessibility audits of the Delhi Metro infrastructure and provided suggestions to improve accessibility for all.

Project Description

Delhi, the capital city of India has set the lead in accessible transportation. The developments and the initiatives/policies etc. undertaken in Delhi are keenly followed by the rest of the country. The best example is Delhi Metro Rail Corporation (DMRC), a joint venture of Government of India and Government of National Capital Territory of Delhi serving Delhi, Gurgaon and Noida. The project has demonstrated how an accessible system creates safe, comfortable and equitable infrastructure, not only for PwDs, but also those with reduced mobility, people with health problems, for example respiratory, cardio-vascular, joint problems or temporary ailments; senior citizens; pregnant women; families with young children and people with heavy luggage etc.

To its credit, the Delhi Metro from its inception wholeheartedly embraced the need for access for PwDs. Samarthyam, a civil society organization promoting universal access in the Asia Pacific region, began advocating for the access needs of PwDs from the early stages of the project. Samarthyam, National Centre for Accessible Environment, approached DMRC with the objective of ensuring that the design of all the stations is in consonance with the diverse access needs of PwDs. It conducted the first Access Audit (accessibility check) during the under construction Seelampur station (renamed Welcome station) in March 2002 along with DMRC engineers and architects. The access audit team comprising people with diverse disabilities and a checklist, observed:

- Drop off lanes and parking to the station entrance, ticket and automatic fare collection (AFC) counters;
- Proposed placement of guiding path and warning strips;
- Lifts and stairs;
- Approach to the platform and toilets proposed to be built outside the station; boarding and alighting from the coach;
- Public announcement system and digital displays on the platform and coach.

It submitted its suggestions and recommendations supplemented with photographs to DMRC for implementation. Sensitization workshops for policymakers and stakeholders were also conducted during this time. DMRC promotes user group perspective and invited Samarthyam for access audits and inputs on other metro stations/services from time to time.

The Persons with Disability (Equal Opportunities, Protection of Rights And Full Participation) Act 1995, requires non-discrimination in built environment and transportation. Provisions of the minimum standards of accessibility for the Delhi Metro are based on the PWD Act 1995 and its standard requirements and guidelines. In consonance with the UNCRPD, signed and ratified by the Government of India (GOI) in 2008, accessibility in the Delhi Metro was promoted to 'eliminate barriers that people with disabilities face in transit systems'.

The biggest success is that the rationale for access is no longer required for public agencies, it is now a given. It is no longer a question of why or how much, but how does the concerned

agency do it best. This is a measure of the success of the Metro, the impact of advocacy and awareness and also the promotion and implementation of the UNCRPD. The DMRC too has been consequently looking to improve shortfalls in accessibility in future phases of the Delhi Metro, studying the deficiencies and user experiences to create a better system.

In short, the basic principles of the access audit are as follows: Promote universal accessibility, and measures of positive action to make public transport-mass rapid transport system fully accessible and provide inclusive infrastructure for transport of disadvantaged groups in order for them to experience a seamless journey from origin to destination.

Methodological Approach

- Studying deficiencies and accessibility issues;
- Identifying barriers and providing alternative solutions for a barrier-free environment and universal accessibility;
- Understanding and examining user experiences;
- Outlining basic principles for accessibility (universal accessibility, measures of action to make public transport fully accessible and inclusive, providing trip chain accessibility);
- Preparing access audit checklist;
- Conducting access audits in selected sites/infrastructure;
- Sensitization workshops for policymakers and stakeholders;
- Further suggestions/recommendations.

Strategic Intervention

Obstacles in existing transportation systems i.e. vehicles, terminals, and operations induce fatigue, restrict educational and employment opportunities thus causing frustration. They hinder the right to freedom of movement, equal participation and access to health and other social services.

To provide accessibility in urban transit systems, an invaluable tool is user feedback. While interventions for inclusive design have seen specific changes in existing systems, DMRC was the first system in India to be designed with a holistic approach towards universal accessibility. This comprehensive planning approach translated into accessible trains, stations, services and facilities. Buttressed by its educated and enabling support staff, the empowerment it provides not just in terms of access but in attitude, acceptance and understanding highlights the crucial role accessibility can play in society.

It is important, therefore, to emphasize the experiences of diverse users and document their feedback, both positive and negative. This will not only inform better design and implementation, but also give impetus to more inclusive design. Towards this goal, access audits were conducted at 12 metro stations to analyze physical barriers experienced by wheelchair users and mobility aid users, persons with visual impairments; old people, women and children. The objectives were to:

- Address barriers and improve access;
- Understand universal accessibility and its linkage with sustainable transport;

- Define parameters for application of universal accessibility principles and standards, which affect public transport usage;
- Promote a greater sensitivity and innovation in universal design beyond minimum requirements.

Type of Measure

- Access audits of public transportation systems;
- Training and sensitisation workshops for stakeholders and policy makers;
- Providing detailed and specific measures as well as solutions for universal accessibility and a barrier free environment. Some of these include: (i) announcements of train arrival and departure to provide information, (ii) bright, colour contrasting, large signage boards overhead to help those with low vision, (iii) warning tiles along the tracks to inform of the platform edge, (iv) well lit train carriages, with constant announcements about door closures, station arrival information and departure, and (v) all elevators provided with Braille and tactile buttons for ease of use.
- Accessible elements not only aid the diverse user groups to individually navigate this system, but also with its standardized nature, create awareness for others unfamiliar with their purpose. They inculcate in all users the efficacy of these elements, sensitivity and familiarity which serve to enlighten the vast audience the Delhi Metro serves.

Implementation Process

The DMRC has set an example for Universal and Inclusive Design in India. The built stations provide features such as designated parking for PwDs; ramps with hand rails; guiding paths and warning strips for vision impaired persons; bright colour contrast for low vision persons; large lettering and information displays and signage; lifts with lowered control panel with Braille and raised control buttons and auditory signals; wide doors and grip rails on the sidewalls of the elevator car; resting areas for senior citizens and disabled persons; well-lit corridors; and, widened ticket gate to accommodate wheelchair users. Inside the coaches, there are designated spaces for wheelchair users, audio announcements with dynamic display and sensory door closing mechanisms.

Also, Metro Sahayaks (or Metro Helpers) are present at stations to provide assistance at all times. They are invaluable not only for PwDs, but also to senior citizens, new users and others unfamiliar with the system.

DMRC was committed to making the Metro system accessible in its growth plan and was always receptive to constructive feedback, regularly conducting access audits at most stations to make them user-friendly and safe. Samarthyam later provided inputs for further improvements which included the following: lowering the ticket counter height/single window facility; distinct sound beeper for orienting vision impaired persons; and transit ramp to bridge horizontal and vertical gap between the coach and platform. The toilets constructed by a private agency for PwDs required modifications in their design. Samarthyam

forwarded the design of an accessible toilet to DMRC and the private agency. The Chief Architect, DMRC is following up on all suggestions.

Outcome

- Increased sensitivity and enhanced understanding amongst DMRC officials, planners and design team towards need for accessible transportation;
- Enhanced information and perception of universal accessibility and its benefits to other policy and decision makers;
- Promotion of inclusive and universal design resulting in more passenger inflow, less travel time and increased revenue generation;
- Increased ridership because of reliable, affordable and comfortable mode of public transportation thereby reducing use of private modes of transportation;
- Increased education and employment opportunities and the integration of persons with disabilities into mainstream society; and
- Promotion of a comprehensive planning approach.

Today, there is an increased sensitivity and enhanced understanding amongst Government agencies, the private sector, NGOs and other stakeholders of the need for accessible transportation. Inclusive and Universal Design would result in more passenger inflow, less travel time and added revenue generation for the service providers. Its reliability, affordability and comfort would attract people using private modes of transportation. It would also result in increased education and employment opportunities and the integration of PwDs into mainstream society.

Replicable Aspects of the Intervention

Samarthyam on the basis of its experience believes that it is an equal responsibility of PwDs (user groups) to advocate/articulate the need for accessible public transportation, to the concerned departments/stakeholders. Cooperation, coordination and a constructive approach between the user groups and the implementing agencies during the policy formulation and execution, is the best approach in achieving the desired objective of “Mobility for All”.

Accessible and equitable connectivity that the Delhi Metro provides has shifted the design paradigm of public transportation infrastructure towards creating accessible systems and services. As a model system, it is being studied for replication in other cities across India including Chennai, Hyderabad, Bangalore and Kochi, among others. As a working system, its challenges and success are being highlighted, the drawbacks and limitations worked upon for better accessibility.

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ACCESS AUDITS OF BUS AND BUS SHELTER AS A PART OF PROMOTION OF USER-FRIENDLY PT SYSTEMS IN DELHI - IMPLEMENTATION STRATEGIES

SNAPSHOT

Name	Accessibility of Buses and Bus Shelter - "Research Study on Promotion of user-friendly Public Transport Systems"
City	Delhi
Duration	2006
Current Status	Operational
Brief Description	Samarthyam with a mission to promote 'Mobility for All' (including persons with disabilities) conducted a research study on "Promotion of user-friendly Public Transport Systems - Buses & Bus Shelters" in India to provide user groups' perspective on existing bus shelters & Low Floor Buses (LFB) and upcoming BRTS introduced by the Delhi Government. During the course of the research study on accessibility of buses and Bus Q Shelters (BQS) conducted in 2005, Samarthyam had suggested to various concerned departments to make the bus shelters universally accessible. In 2006, the entire route of 620 buses (on which the Low Floor Buses are plying) i.e. from Hauz Khas terminus to Shivaji Stadium terminus has been selected for the same. Drawings and sketches with universal designs of BQS are being implemented by both DTC (225 BQS) and NDMC (197 BQS). Samarthyam is monitoring the construction process and Delhi NCR and other adjoining cities have similar designs of accessible bus shelters.

Project Description

The existing buses, terminals, operations are full of obstacles, which induce fatigue; impinges on the right to freedom of movement, access to health and other social services. Disadvantaged persons such as senior citizens, persons with reduced mobility and persons with disabilities constitute approximately 40% of the population. Barriers to mobility discriminate against this group, preventing them from accessing activities that contribute to living a dignified and meaningful life.

Growth in the elderly population, allied with greater integration of PwDs into daily life, has led to greater demand for transit service to meet their mobility needs. The projected growth presents an opportunity for new design options, for example, LFB and accessible BQS. Samarthyam with a mission to promote 'Mobility for All' conducted a research study on "Promotion of User-friendly Public Transportation system - Buses and Bus Shelters" to provide user groups' perspective on existing bus shelters & LFB and the upcoming BRTS introduced by the Delhi Government. It aimed to document the existing infrastructure, evaluate and assess the public transportation services in Delhi.

Methodology

An access audit team comprising persons with diverse disabilities, architects and engineers conducted accessibility checks of bus terminals/shelters, existing high chassis buses and the newly introduced LFB. Information was collected by questionnaire from 100 PwDs and interviews/opinion survey of 15 eminent transport planners from Indian Institute of Technology Delhi (IITD), New Delhi Municipal Council (NDMC), School of Planning & Architecture and Delhi Transport Corporation (DTC) was carried out. The results of all the access audits and recommendations were compiled into a database, supplemented with photographs, illustrations, sketches and drawings and shared with transportation experts and the Government.

Strategic Intervention

In order to obtain the desired outcomes, several initiatives were undertaken. Information from 100 PwDs was collected. Interviews/opinion surveys of eminent transport planners from IITD, NDMC, SPA, DTC, PwDs, architects and engineers were also conducted for accessibility checks of bus terminals/shelters, existing high chassis buses and the newly introduced LFB by the

Delhi Government. The outcomes were shared with transport experts and the Government. On the basis of this analysis and results, Samarthyam designed a cost effective prototype of BQS at Hauz Khas Terminal which was approved by the Minister for Transport on 19th March 2006.

Type of Measures

The action oriented Research Study had led to ample scope for expansion, replicability and sustainability which emphasised both short and long term perspective planning. The Union Ministry of Social Justice & Empowerment granted Rs. 1 crore (US\$ 2,40,000) to build 25 BQS on the LFB route to DTC. NDMC awarded construction of 197 BQS on Buy-Operate-Transfer basis to J. C. Decaux advertising company. A joint inspection by NDMC, Samarthyam and J. C. Decaux of the first BQS at Humayun Road was conducted and construction has also been completed.

Implementation Process

Samarthyam approached DTC and NDMC with the BQS design, requesting the two agencies to construct a prototype in their respective jurisdiction including the Delhi Transport Department. The Minister for Transport, Delhi approved the design and issued instructions to make a model BQS at the Hauz Khas Terminal operated by DTC. The construction process was facilitated by Samarthyam and the prototype was inaugurated by the Minister on 19th March 2006, in the presence of international and national experts and participants of the first National Conference on Accessible Transportation “Mobility for All”. The prototype design comprised a bus shelter at a height of 380 mm, synchronizing with the chassis level of LFB, thus making it convenient for embarking and disembarking by all users. The BQS is equipped with ramps on both sides; tactile warning tiles for persons with vision impairment; Braille plate with route in-

formation; space for two wheelchair users with access symbol painted on the ground; information signage; colour contrast and priority seats.

Outcome

The major outcome of the Research Study was a cost effective BQS based on the principles of universal design by Samarthyam. The Minister for Transport, Delhi approved the design and inaugurated the prototype at Hauz Khas Terminal in March 2006. Samarthyam volunteered to facilitate and monitor the construction process with the user group inputs and conduct feasibility field visits of all the BQS falling under the jurisdiction of DTC.

Replicable Aspects of the Intervention

The introduction of LFB and the upcoming cost effective Bus Q Shelters in the NDMC, DTC and BRTS, with its inclusive and universal design is the result of partnership between the users, service providers and a people-focused emphasis incorporated into transport planning. The growing service needs, the public responsibility, the varied advantages that low floor buses offer to all public with the new BQS design, suggest their value as an integral component of future accessible public transport system in both semi urban and urban areas. Samarthyam’s model of user-transport service provider consultation and cooperation has proven to be successful towards making buses accessible for all. Samarthyam is monitoring the construction process and Delhi NCR and other adjoining cities have similar designs of accessible bus shelters.

Source of Information

Details provided by:

Anjlee Agarwal

Executive Director | Access Consultant

Email: samarthyaindia@yahoo.com

CATEGORY 4

GREEN LOW CARBON TRANSPORT

Transport in developing countries is the one of the largest, and fastest growing, sources of GHG emissions. Transport related CO₂ emissions are expected to increase 57% worldwide in the period 2005-2030, and it is estimated that transport (passenger and freight) in developing countries will contribute to about 80 percent of this increase¹. At the same time transport is largely missing in climate change mitigation policies and actions worldwide and in particular those aimed at the developing countries. Growing GHG emissions from the transport sector in developing countries are inextricably linked to an overall lack of sustainability expressed by poor urban planning, increased motorization, increased air pollution and noise, growing congestion and decreasing road safety. Technological improvements by themselves will not be enough for the transport sector to make a significant contribution to mitigation of GHG emissions; a sector-wide re-orientation to low carbon sustainable transport is required which combines policies and measures to: (a) avoid/reduce the need for travel, (b) shift to, or keep transport as the most efficient mode, and (c) improve efficiency of motorised modes of transport.

India is currently the fourth largest GHG emitter in the world, with its transport sector being the second largest contributor of CO₂ emissions. The sector also aggravates road congestion, local air pollution, noise and accidents, particularly in urban areas. Developing countries such as India need to make their transport systems and infrastructure low carbon and more sustainable through a combination of: increased public awareness, low-carbon, sustainable transport policies, supportive policy instruments, institutional capacity development, appropriate pricing mechanisms and mobilisation of financial resources.

In terms of policy changes, steps have already been taken through the national urban transport policy which strongly calls for bringing about a modal shift in favor of public transport (by improving the PT system as well as discouraging use of private vehicles through instruments such as heavy parking charges) and improving/creating infrastructure for non-motorised vehicles. Such overarching policies are in some measures being translated into projects such as the Delhi metro which apart from

energy savings, boasts of saving 4,57,615 tonnes CO₂ annually; the bike sharing scheme which was initiated on the existing BRT corridor (with separate bike lanes on both sides) in Delhi; and so on. Similar initiatives have been shortlisted and illustrated through the following table.

Ecocab is the name given to the dial-a-rickshaw service provided through an organised network for the first time in the world at Fazilka. Fazilka is an Indian Border town with population less than 100,000. It is the first city in the world to have a dial-a-rickshaw facility. Apart from providing better mobility services to the inhabitants, the initiative attempts to improve the livelihood for rickshaw pullers, lead to reduction in GHG emissions, and facilitate promotion of the green mode of transport in small, medium and even in large cities. The initiative has been included as a detailed documented project in the subsequent section.

Under JnNURM, Nanded Waghala City Municipal Corporation (NWCMC) has developed 28 km of cycle tracks and achieved the aim of segregation of slow and fast moving traffic. The aim of the project is to strengthen the city road network, connecting all parts of the city, enhancing network movement. The newly developed roads in Nanded are unique in terms of providing equal road space allocation to all types of road users. The initiative undertaken by NWCMC has been illustrated as a snapshot under Green-Low carbon initiative category.

S. No.	Name of the Project	Location
1	Fazilka Ecocab- dial-a-rickshaw project	Fazilka, Punjab
2	Metro Delhi (also called Modal Shift project) India	Delhi
3	Dipbahan Rickhaw Bank Project	Guwahati, Assam
4	Green Bike-Ambedkar Nagar to Moolchand, Delhi	Delhi
5	Automated Tracking and Control of Green Assets (ATCAC) Bike Share, Bangalore	Bangalore, Karnataka
6	Inclusion of NMT related Infrastructure by re development of major roads in Nanded	Nanded, Maharashtra

¹ Partnership on Sustainable Low Carbon Transport (SLOCAT), Sustainable Development Knowledge Platform, Division for Sustainable Development, United Nations

² Presentation by DMRC at Workshop on CDM- "Subsidy to Fossils or Leapfrog to Technology" Centre For Science & Environment, New Delhi November 17,2011

FAZILKA ECOCAB

Abstract

Ecocabs were conceptualised and introduced so as to strengthen the existing unorganised network of cycle rickshaws and to promote it as an affordable means of sustainable urban transport especially for shorter distances. An attempt has been made to improve the various aspects of the cycle rickshaw industry including accessibility issues, quality of service, welfare of associated traction men, rickshaw itself and the society at large.

Background

Rickshaws were first seen in India around 1900 AD and have gained significant popularity since then. Today, cycle rickshaws form an integral mode of transport in our cities and can be seen plying in almost each and every city in India. They have become a preferred mode of travel in our cities, especially for shorter distances. They work on pedal power and can carry upto two passengers at a time. Cycle rickshaws not only serve as an affordable means of travel but also have various other environmental benefits. Their compact and flexible design allow them to comfortably pass through narrow lanes where other public transport modes generally find it difficult to reach. With the advent of modern technologies, a step has been taken to promote this already existing sustainable mode of transportation – ‘cycle rickshaws’. An ‘Ecocab’ is basically a dial-a- rickshaw service developed on similar lines as a dial-a-cab service. The main idea was to bridge the gap between demand and supply through equal distribution of fleet and automation using latest IT tools

and real time technologies. The concept was launched for the first time in the world at Fazilka, a small town in the state of Punjab near the India Pakistan Border.

Need for the Project

The city of Fazilka has more than 20,000 registered motor vehicles, the majority being two wheelers. It is estimated that residents make about 80,000 household trips daily. Rickshaws make around 5,000 trips that constitute only 16% of the total trips, while the remaining 84% trips are serviced by the private sector and IPT (autos). Fazilka does not have a public bus transport system. Rickshaws are the main available means of transport within the city, used largely by the elderly, families, and women. Over the years, this has led to an increase in the modal share of auto operations in the city. The average trip length within the city is less than 3 km. 26% of the total population own private modes of transport.

Before the introduction of Ecocab, the rickshaw operations were limited mainly to market areas rather than residential areas. Also, rickshaw operations were mainly unorganised. Maintenance and quality of rickshaws was poor and unfit for safe usage. No support was being provided by ULBs as the financing options that were available were unviable due to high interest rates. No policy level interventions were being made to improve services.

Due to high motorisation, the existing rickshaw usage was declining, which was responsible for providing livelihood to more than 500 poor families within the city. Given the focus on



Figure 12: Mobile Application for Eco - cabs

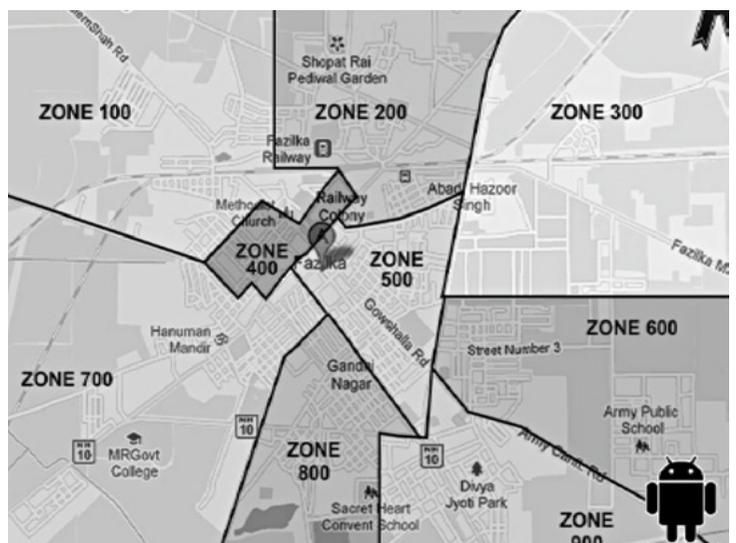


Figure 13: Nine Eco - Cabs Zones



Figure 14: Ergonomically Designed Ecocabs

sustainable transport which the Government of India has been recommending, there was a need to revamp the rickshaw system as it is a safe and environment friendly mode of transportation. Also, financially it provides instant livelihood with very low operation and maintenance costs.

Project Description

On 20th June 2008 dial a rickshaw (Ecocab) facility was launched in Fazilka. The vision of the project is to organise and improve scientifically, the existing rickshaw operations using modern management tools and real time technologies so as to promote it as a sustainable para transit mode of public transportation. The project idea is to strengthen the existing unorganised network of cycle rickshaws in order to promote non-motorised transportation facilities as a low cost, self-sufficient, postmodern technology for short distances. The project is being carried out in two phases:

- Phase-I: Accessibility has been improved by providing facilities such as dial a rickshaw to residents;
- Phase-II: Providing improved quality of rickshaws to the user at the same cost.

For the first phase of development of the project, creating call centers for Ecocabs and providing accessibility to rickshaws from homes was taken on priority. The project sub-divided the city into nine Ecocab call centers from where the user can dial for a rickshaw at his/her doorstep. Each center was provided with a six digit easy to remember phone number which was publicized in the concerned locality, which comprised about 1,500 household units. These centers, along with the network of 20-feeder sub centers, are strategically placed to reduce travel time, so that after a phone call, Ecocabs shall reach the desired location within 10 minutes. This aims to facilitate household trips and discourage increased use of personal motorised trips within the city. As the average trip length in the city is less than 3 km, it was easy to promote cycle based intermediate public transport systems. At present a fleet of 500-registered traction men are self-employed under the Fazilka Ecocab project.

The application of intelligent transport system is done through the implementation of mobile-based technology to the rickshaws system. It is the world's first mobile-based application

for rickshaw services. The users and rickshaw operators make use of innovative technologies such as Google Maps on Android to display the Ecocab center for easier searching. QR based Digital Identity cards for cab operators are also being provided. The user can locate the nearest Ecocab call center using the inbuilt GPS or call the rickshaw with a single tap on the call button.

Bharat Sanchar Nigam Ltd. (BSNL) has decided to provide free pre-paid mobile connections to the Ecocab operators in Fazilka. These Ecocab operators would be able to talk to each other on these mobile numbers free of cost. Nine hundred pre-paid mobile connections would be provided here under the Close User Group (CUG). In Fazilka, all Ecocab operators have been registered zone wise and given 3 digit registration numbers. Another feature of this plan is that the last three digits of the mobile number of each Ecocab operator is same as their Ecocab registration number.

Under phase-II of the project Ecocab, after improving accessibility to the residents, better ergonomically designed low cost lightweight Ecocabs have been introduced under different models. Some specifications are:

- 0.25 Horse Power/lightweight;
- With FM/music and newspaper facility;
- Rickshaw on Demand;
- Ergonomically designed models such as Femto and Nano;
- Low Floor;
- More luggage space;
- Aerodynamically designed;
- More stable and safe;
- More advertisement space.

One Ecocab costs about Rs. 9,000 and finance for the same is being organized through nationalized banks under RBI's Differential Rate of Interest Scheme (DRI) at a 4% annual rate of interest. Overall organization and registration of Ecocabs is being taken care of by the state local body department in association with local NGOs/partners.

Under the PPP model, corporate and FMCG companies have been contacted for advertisements on the Ecocabs. The additional revenue that would be generated through advertisements on Ecocab in an organized network would be given to traction men for the repayment of EMI on Ecocabs and for the smooth operation and management of Ecocabs.

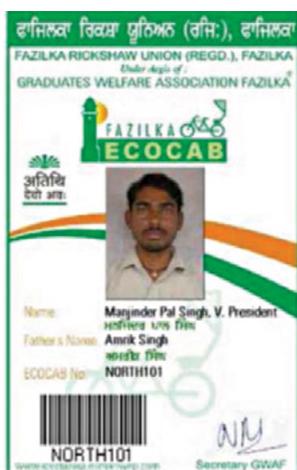


Figure 15: Sample Digital Identity Card being issued to Ecocab Members

Guiding Policy Document/ Act/Notice

The policy that exists for Cycle Rickshaw operations in the city is “The Punjab Cycle Rickshaw Act -1976”. The Act needs a few amendments which would further strengthen the operation of Ecocabs. These are listed in the table below:

Project Implementation

This main concept of Ecocabs aims at providing easy access to the public in the form of an intermediate public transport system. One key reason behind the success of the project in Fazilka is that the average trip length in Fazilka is less than 3 km, which is suitable for promotion of any cycle-based mode of public transport.

Under the project the Ecocabs needs of all the three key stakeholders mainly traction men, rickshaw, and the society are being taken care. The model is based on the generation of additional revenue for traction men through advertisements, fleet booking etc.

Other welfare schemes are already been conceptualized and implemented at Fazilka for rickshaw operators. These include:

- Free winter wear & woollens;
- Free medical consultation by 10 leading private hospitals and doctors with different areas of specialty, medicines by authorized medical stores and free required laboratory tests;
- Free legal aid by four leading lawyers;
- Permanent distribution of mobiles at subsidized rates to the rickshaw operators;
- Annual Ecocab family trips;
- Ecocab stands by Municipal Council Fazilka in various zones of Fazilka; and
- Computer education for a few educated traction men by two computer centres in Fazilka.

Results and Impacts

At present more than 500 traction men are working within the Fazilka urban limits. Benefits given to them by the Graduates Welfare Association Fazilka (GWAF) include Rupees 50,000 free accidental insurance, free education, digital identity card, free medical consultation in all leading private hospitals in Fazilka, free legal help cell to handle their day to day problems, better rickshaw stand facility with office and free dress.

The project also helps save about 900 liters of fuel daily which could pollute 14,500 kg of fresh air. It also provides better law and order in the city by providing employment and quality Ecocab services with modern ergonomically designed Ecocabs. The new system also benefits visitors and tourists in the city.

The Government of Punjab through the Punjab Heritage and Tourism Promotion Board and District Administration Amritsar has already implemented Ecocab in the holy city of Amritsar and subsequently in Patiala with the help of a Local NGO “The Patiala Foundation” under the name “Green Cabs”.

The Financial Internal Rate of Return for the project has been estimated at 8% whereas the Economic Internal Rate of Return of

TABLE 5: PROPOSED AMENDMENTS IN EXISTING CYCLE ACT

Existing Cycle Rickshaw Act	Proposed Amendments to the Ecocab Act
Upper Age Limit for traction man 45 Years	No Upper Age Limit, purely based upon the Physical Fitness of traction man (similar to Motor Vehicle Act).
Licensing System	One Time Registration instead of Licensing, fee can be deposited on yearly basis (similar to Motor Vehicle Act).
Renting of Rickshaw is Not Allowed	Renting is allowed with upper ceiling limits for fleet. This will encourage investment in this sector.
Outdoor Publicity Banned	5 Sq ft Area on Ecocab (Sides and Backs) is allowed/created for advertisements to generate additional revenue for traction man
Enforcement, Confiscation/Heavy Fines	Ecocab Management Committees to implement enforcement mechanism
Complicated Registration Procedure	Single Door Clearance System/Outsourcing

TABLE 6: BENEFITS OF ECOCABS

Improvement in travel speed	The Ecocab operational speed is same as before.
Reduction in accidents	Two fatal accidents reported in Punjab state for the year 2010.
Reduction in GHG	One Ecocab saves on average 3 litres of fuel and 45.5 kg of fresh air required to burn that same fuel.
Reduction in air and noise pollution	Reduction in noise and air pollution.
Reduction in energy consumption	On average one Ecocab saves about 3 litre of fuel per day and it is being propelled with pedal power instead of thermal or fossil fuel. In Fazilka alone 500 Ecocabs save about 1,500 litres of fuel per day. Advocacy through Ecocabs is saving about 9 lakh litre of fuel across Punjab and Haryana per day.
Socio economic benefits	Supporting the livelihood of 500 Ecocab families in Fazilka and more than 6 lakh families in Punjab, Haryana and Chandigarh. Already been implemented in more than 20 cities of Punjab.

the project is around 12% indicating that the initiative is viable both with respect to financial and economic parameters within 2 years of operations. Details are given as annexure 1 below.

Key Stakeholders and Roles

The rickshaw pullers in the city are the major stakeholders followed by the BSNL Company which provides them with technical support. The project has been conceptualized and managed by Graduate’s Welfare Association, Fazilka.

Enabling Environment and Barriers

- The motivation brought about among the rickshaw pullers to have an organized IPT system which would be beneficial both to them and to the city residents as well; and
- The organized IPT increasing the reliability of the system compared to alternate modes.

Key Lessons, Continuity and Replicability

The organization of the NMT sector can supplement the transport demand in the city in a sustainable manner and also improve the financial status of the NMT operators. The success of this initiative lies in community participation and effective coordination between various departments of the government.

Contact Details of Concerned Official

Name of the Contact Person: Mr. Navdeep Asija*
 Designation: Secretary (Admin)
 Organization: Graduates Welfare Association Fazilka
 Email ID: contact@lovefazilka.org
 Contact Number: +91 9464413323

* Mr. Navdeep Asija requested the consultant to document the project with the help of secondary database only and expressed his inability to meet the project team.

INCLUSION OF NMT RELATED INFRASTRUCTURE BY REDEVELOPMENT OF MAJOR ROADS IN NANDED

SNAPSHOT

Name	Inclusion of NMT related Infrastructure by redevelopment of major roads in Nanded
City	Nanded, Maharashtra
Duration	DPR approved 25/10/06; most works completed by Sept 2008
Current Status	Under Operation
Brief Description	Under JnNURM, Nanded Waghala City Municipal Corporation (NWCMC), has developed 28 km of cycle tracks and achieved the aim of segregation of slow and fast moving traffic. Construction has been completed and 95% of the work has been completed and commissioned.

Project Description

Nanded is a small sized town by Indian standards. It has a population of about half a million and an area of a little over 50 sq. km. The city has an important Gurudwara – a Sikh temple, and is one of the five most important holy places for Sikhs. Celebrations were planned in 2008 to mark 300 years of the setting up of the Gurudwara and around 2.5 million pilgrims from all over the world visited Nanded in the week around these dates. The city of Nanded has been included in the JnNURM program and major investments in upgrading the physical infrastructure are currently underway. A major initiative to improve the streets of the city is also underway. About 50 km of streets in Nanded are being redesigned and built. These include:

- The important roads in Nanded’s old, dense city-centre;
- About half of the main roads in the northern part of Nanded (north of the railway); and



Figure 16: Cycle Track and Footpath in the city of Nanded

- A number of partly connected roads in the still undeveloped south of Nanded (south of the river).

The roads range from Right of Ways (RoW) from 9 m to 30 m with varying configurations. There has been growing awareness about promoting NMT which has been achieved by segregating slow and fast moving vehicles, and providing designated safe spaces for pedestrians.

Strategic Intervention

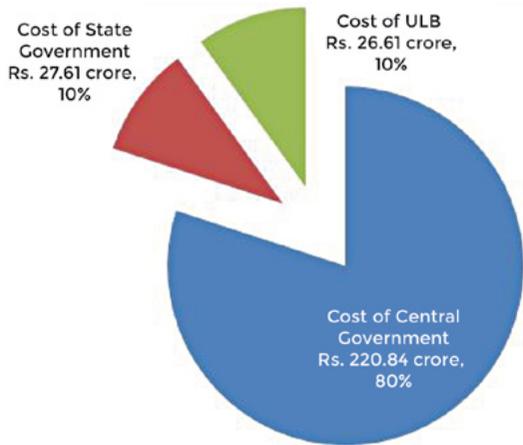
The project aims at promoting NMT in the city of Nanded. Given the city size and travel needs, it was well understood that there was no need for an MRTS. The existing NMT and pedestrian facilities required revamping. Usually large investments are made to improve vehicular traffic flow; however in a few cities such as Nanded, an optimal budget has been allocated to improve the convenience/safety of NMT. The project is being managed by Nanded Municipal Corporation.

The road cross-sections have been designed keeping in mind the chaos and confusion that exist in a typical Indian street as of today. The main source of this chaos is the mixed traffic conditions prevailing in our streets with a range of vehicles such as bullock carts, cycles, cycle-rickshaws, auto-rickshaws, two wheelers in huge quantity, cars, buses and trucks plying on the roads. Detailed activity studies and traffic counts were carried out at important parts of the existing streets and these were translated into the plans. The design approach has been to find space for all the activities that exist.

The most important component of the design has been to segregate the Motor Vehicle traffic from the Non-Motorised

(cycle rickshaws, hand pushed carts, vendors' carts along with cycles). Adequate space has been provided for the pedestrians since they form the majority of the users. A separate ribbon has been provided on one or both sides of the road depending on the space available. This is called the Multi Utility Zone (MUZ). This zone has been detailed out to carry the following functions:

- Bus Stops
- Street Lighting
- Trees
- Parking for cars, two wheelers and cycles
- Auto rickshaw stands
- Hawker platforms
- Public toilets
- Electrical and telecom distribution panels and package type transformers
- Garbage bins
- Advertising structures
- Signages etc.



Provision of designated areas for these functions would allow for better enforcement of traffic rules as these activities tend to spill onto the movement areas and become a bottleneck as well as a hazard. This would improve the traffic flow. The designs were made in such a way to be completely accessible, and traffic calming details were incorporated to make the streets safer. Provision of high quality cycle lanes has resulted in encouragement of this sustainable and greener mode of transport in the city.

Funding Scheme: The approximate cost of this project is Rs. 276.05 crore. The share of the Central Government is the maximum (80%). The success of this project is largely because of community participation and buy-in of the project. The project involved prioritization of activities along with persistent discipline to adhere to activities to their allocated spaces. The early success story of the project has also helped in getting cooperation from the other planned road users.

Type of Measures

The city of Nanded has implemented a project that seeks to embody the phrase "Roads are for people". This has been achieved by segregating slow and fast moving vehicles, and providing designated safe spaces for pedestrians in the form of foot paths. Street vendors, trees, and street lights are all carefully placed along the road side to create a "boulevard" feel, effectively separating rioritiz and non-motorized traffic. In addition, the project also includes riverfront developments, a new sewage system and treatment plant, a new hospital and museum, the conversion of an airstrip to a complete airport, and improvements to the railway station. A big impetus for the project was the 300th anniversary celebration in Nanded of the consecration of the Sikh Guru Granth Sahib in 2008. This project deals with 38 roads varying from 9 m to 30 m in

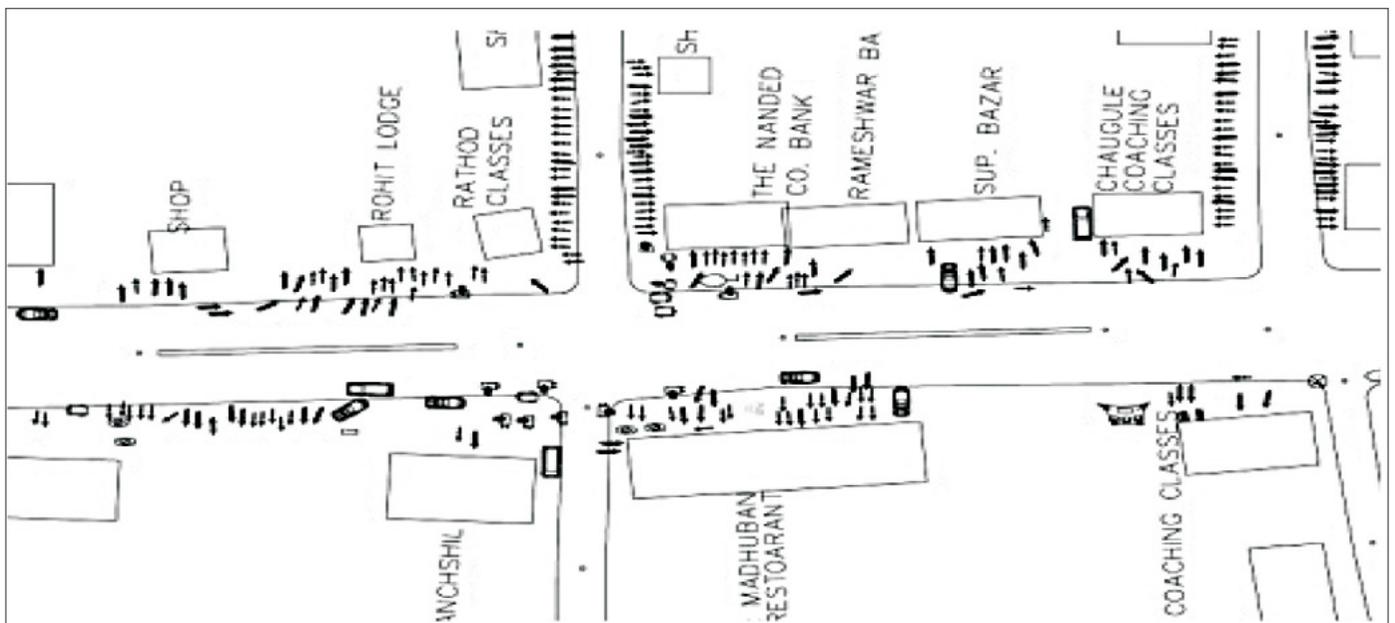


Figure 17: Typical Activity Analysis- Activities on Necklace Road at 11.30 am

Outcomes

THE MAJOR BENEFITS OF THE PROJECT ARE LISTED BELOW:

Physical Improvement in Travel Speeds	Segregation of the different types of traffic have resulted in increased travel speeds for both NMT and motorised vehicles.
Reduction in Accidents	Segregation of traffic has helped reduce accidents to such an extent that at the time of inquiry, not a single major accident had been reported in the past three years.
Environmental Parameters Reduction in greenhouse emissions	The introduction of several trees along the roadside has made the city more aesthetically pleasing – officials like to refer to the change as “the conversion to the Green City”.
Reduction in air and noise pollution	Reduction in horn usage has been reported as a result of the traffic segregation. Increased travel speeds, along with more and more people opting for NMT travel, has also led to a decrease in air pollution stemming from vehicle emissions

Figure 18: Benefits of Nanded NMT Project

width, together constituting 50 km out of the city’s total of 400 km of roads. As part of the redevelopment process, the city has implemented 28 km of cycle track, and has shown remarkable adherence to the principles outlined in the National Urban Transport Policy.

Implementation Process

The implementation of the NMT and safe pedestrian facilities focused on the following principles:

- Safety
- Coherence
- Directness
- Attractiveness
- Comfort

The project has got a mixed response from the residents of Nanded. Issues such as Road No 8, a busy shopping area, which has vehicles encroaching footpaths and hawkers’ platforms persist. Shoppers complained that the new design reduced the main road to half. Also, the attempts at promoting NMT have not been able to reduce private vehicle usage. The public transport system also needs to be strengthened to achieve all the stated benefits. Presently, the unorganized auto rickshaws and taxation system on cars is not complementary to the NMT

vision. Such projects require persistent awareness campaigns which showcase the success being achieved and market their benefits such as safety, reduced crashes, increased speed and integration of all activities on streets including aligned utilities and amenities.

Replicable Aspects of the Intervention

The designs of roads have been prepared on the principle of equitable space allocation for all road users with a “focus on people rather than automobiles”. Based on secondary review from ADB and other agencies, the Nanded Roads Project is an extraordinary project. Its scale in terms of the number of roads to be re-engineered and the commitment to provide appropriate facilities for cycling and walking on these roads are unique for India. The project, when properly executed, could become a model for hundreds of similar-sized Asian cities that aspire to develop a sustainable, safe and pleasant, people friendly street atmosphere.

Source of Information

- http://sti-india-uttoolkit.adb.org/mod5/se5/002_3.html
- <http://www.uncrd.or.jp/content/documents/4EST-P4-1.pdf>
- Best Practices in Urban Transport – Report Prepared by Institute of Urban Transport (India).

CATEGORY 5

COMMUNITY ENGAGEMENT

Community participation and its merits have long been recognized in the field of spatial planning but is yet to be mainstreamed in the case of transport planning. It not only enables better and customized solutions (need based) to problems, but also engages users and creates a positive outlook ensuring better acceptability by the users. Delhi BRT is an excellent example of how a lack of understanding of the overall implications of a system can create a bias so strong amidst the users that the system itself might fail due to lack of acceptance.

One instance of using community participation for plan preparation is the initiative called 'Aapki Sadak: Alternative Mobility Solutions and Pedestrianisation of Existing Urban Neighbourhoods'. The initiative involved the residents and the civic bodies to make neighbourhood streets pedestrian friendly and enjoyable, and access to the Metro and other public transport convenient. It is about reclaiming the enjoyment of the spaces around our homes which is taken over by motor vehicles. A technical team has got together to work with residents of Malviya Nagar, Khirki Extension and Sheikh Sarai to develop

a consensus plan for the improvement of their streets and environment friendly connections to public transport. Raahgiri Day is a weekly street event which provides citizens with the opportunity to reclaim their streets, connect with their community, celebrate their city and therefore reclaim their lives. The streets of Gurgaon are set aside for citizens to come together in large numbers for recreation that promotes health, well-being, fitness, togetherness and joy. Similar initiatives have been included in the list below.

S. No.	Name of the Project	Location
1	Aapki Sadak: Alternative Mobility Solutions and Pedestrianisation of Existing Urban Neighbourhoods	Delhi
2	Chandigarh Traffic Police Face Book Account	Chandigarh
3	Raahgiri Day	Delhi

ALTERNATIVE MOBILITY SOLUTIONS AND PEDESTRIANISATION OF EXISTING NEIGHBORHOODS: 'AAPKI SADAK'

Abstract

Aapki Sadak is an urban design project that addresses alternative mobility solutions and pedestrianization of existing urban neighborhoods in Delhi. Using art as a medium for communication and exchange, Aapki Sadak facilitated several community based initiatives that address local children as well as the older residents. Street art/stenciling, dance/theater and social networking sites such as word press and Facebook, are the key media being used to engage the community and raise awareness about mobility in the neighborhood.

AAPKI SADAK is a project initiated by Shakti Foundation to promote best practices on mobility and on-street parking management through community participation. The project is developed by Ashok B. Lall Architects (ABLA), in partnership with other independent organizations; Innovative Transport Solutions (iTrans), Oasis Design Incorporated (ODI) and Sandeep Gandhi Architects (SGA), along with Aastha Chauhan, an independent community worker and artist. The project looked towards the improvement of neighbourhood level mobility and accessibility

within a typical urban precinct of South Delhi. It is a community engagement led process with detailed surveys and technical design support to arrive at practical solutions.

Background

In the face of the rapid influx of people into Delhi, the pedestrian areas and public amenities such as public transport have failed to keep pace with the needs of the growing population. Over the past decade, the Delhi Government has added capacity to public transport by increasing the fleet of buses, testing the BRT in a section of the city and introducing the Delhi Metro. However, the number of cars on the street continues to increase every year.

The site selected for the project is located within the urban precinct of South Delhi bounded on three sides by major vehicular roads (Outer Ring Road, Lal Bahadur Shastri Marg and Press Enclave Road). The fourth side is bounded by a congested internal road, Geetanjali Marg, running parallel to the Malviya Nagar Market. The neighborhood being in close proximity to two major public transit corridors, the BRT and the Delhi Metro was

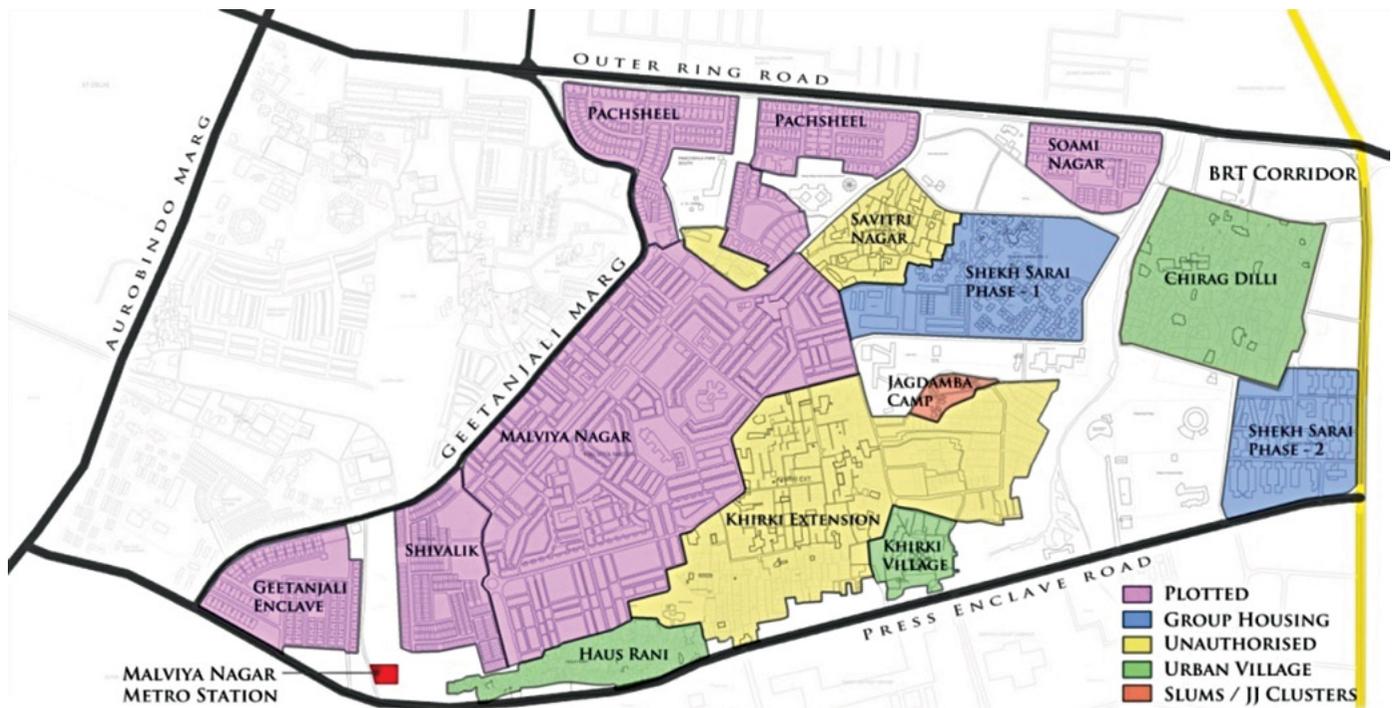


Figure 19: Real condition on ground considering the neighbourhoods and diversity within the selected study area

especially suited as a demonstration project because of the varied public uses and residential densities housed within a geographically small area. It falls in the subzone F-10 as per the Zonal Development Plan of Delhi.

Need for the Project

Large-scale transit projects cannot successfully replace private vehicles if they do not integrate with the 'first and last mile'. The access to the metro, bus facilities from the neighbourhoods in some places are unusable or difficult to use. This discourages people from walking to the nearby metro and encourages them to use private vehicles to their final destination instead. The residents of the project area listed some of the impediments encountered on their daily commute to work, places of education, market and places of worship that are not immediately apparent to the experts and professionals:

- Poor conditions of streets;
- Encroachments by residents, shopkeepers and vendors;
- Lack of footpath, and convenient and safe passage;
- Lack of proper drainage and grading of access roads; and
- Absence of proper support systems to facilitate the older residents.

According to official records, the project area is mainly residential and represented as a single fabric with little complexity. However, even on an initial visual and physical analysis it was revealed that:

- Footpaths are too narrow, high and/or broken;
- Not accessible to differently-abled persons;
- No direct pedestrian or cycle access to important public transit nodes due to high speed traffic barriers;
- Uncoordinated design of public utilities and poor maintenance leading to obstruction of pedestrian traffic (location of electric, pillars, incorrectly placed fencing flooding, flooding in subways etc.); and
- Absence of NMT modes due to over-congestion by personal automobiles and on-street parking.

Project Description

The project focused on the creation of pedestrian and NMT facilities for the people in the neighbourhood and involved communities in the planning process. In addition to the technical, topographical and transport surveys of existing conditions within the neighbourhood, transport user surveys gave an idea of the users' perceptions of the street and public spaces. This information converted into drawings and charts was shared with the residents of the neighbourhood in workshops conducted in the open public spaces, thereby also encouraging passers-by to share their experiences of mobility and access in the vicinity.

Since September 2012, the project team has thoroughly surveyed and analysed the area between Malviya Nagar Metro Station and the Chirag Dilli Bus Rapid Transit corridor. It has engaged closely with over 600 residents from Malviya Nagar, Shivalik, Hauz Rani, Khirki Extension, Sheikh Sarai, Jagdamba

Camp and many more users in the area. Finally, the project engaged with residents, agencies and technical experts in a tripartite participatory approach to gain increased awareness among experts/key stakeholders regarding typical and site specific obstacles towards better pedestrian and NMT access. Additionally, through an active art initiative the local residents were made aware of the reasons behind increased vehicular dependence, poor public transport ridership and a declining social life. It has so far managed to generate a 'buzz' around sustainable urban mobility in the community, developed a set of tailor-made design solutions, generated a strong formal demand from the residents, and initiated a formal dialogue with relevant agencies for execution.

Through all this, there were a number of political, institutional and logistical challenges that were faced by the project team leading to a number of learnings that helped refine and modify the process over the past year. An examination of the project over the next few years will reveal its success; however, for now there is a lot to be learnt from the process so far.

Guiding Policy Document/ Circular/Notice

The initiative takes into consideration the overarching objectives of the National Urban Transport Policy, which promotes sustainable mobility options. The policy also outlines the importance of stakeholders' consultation so as to incorporate the aspirations of immediate users, while taking into consideration the relevant technical details. The policy also highlights the importance of provision of infrastructural facilities for NMT and pedestrians. This initiative recognizes the importance of attempts to sensitise not only decision makers but road users as well.

Project Implementation

The three processes of technical, engagement and sensitization or activities entwined together to reinforce each other, and these often showed unexpected results, based on which the process was modified for further interaction. The surveys and initial assessment revealed the strained social relationships, based around the availability of parking, high density mixed use/activity areas and a sharp social segregation of colonies from each other. However, the demand for pedestrian and NMT/IPT amenities was felt by a majority across the board. These needs were then translated into a clear mission for the project by the team. The communication material and workshop formats evolved were completed to reflect the rising level of awareness and involvement among residents. Art-led initiatives such as wall murals, a cycling event and the 'chalo kyunki' campaign further catalysed the process, culminating in a series of film screenings on the project and about sustainable mobility in general. Maintaining constant contact with resident/local 'champions', helped spread the message and create anchors within the community. Finally, equipped with an intimate knowledge of the physical ground realities and the community's aspirations and demands, the team took up advocacy with the relevant decision venues, including the local Ward Councilor, the Member of the Legislative Assembly (MLA) of the Constituency, the Unified Traffic

And Transportation Infrastructure [Planning & Engineering] Centre (UTTIPEC), the Public Works Department (PWD) and the South Delhi Municipal Corporation (SDMC). While limited political support was received, the UTTIPEC helped the team greatly in taking matters up with the SDMC, which controls a majority of the public RoW under the purview of the project. The matter is being actively pursued with SDMC who seems keen on adopting it. The activities and strategies included in the project mainly fall under three complementary phases:

Technical Activities

The first phase of the project was dedicated to gathering knowledge about the site toward informing the participatory workshops with the residents. Toward this, in consultation with iTRANS, SGA, and ODI, several surveys were identified and carried out. Even before the technical surveys were conducted however, a whole set of secondary data from various sources was gathered, including the Master Plan and Zonal Development Plans of Delhi 2021, Public Transport Plan – Bus service and Metro (existing and future), Municipal Ward Boundaries, Mobility related survey by UTTIPEC, Draft Development Plan of Khirki and Khirki Extn. By TVB School of Habitat Studies and the Archaeological Survey of India protected monuments list. After this a team was commissioned to carry out a detailed Topographical Survey, while the core team proceeded with other types of data collection.

- i. **Visual Survey:** The intent behind this was to enable the team to develop a thorough understanding of the study area.
- ii. **User Survey:** The following five categories of users were surveyed in order to gather data about the users of the public realm:
 - Public transport users
 - Pedestrian or NMT users
 - Vehicle owners
 - Shops/business owners
 - Auto rickshaw/taxi drivers/operators

The outcomes observed from the technical phases were as follows:

- 39% people walked to their destinations in spite of owning vehicles;
- 36% and 32% of the surveyed walked to work and educational institutions respectively;
- 24% people surveyed walked for more than 15 minutes to reach their destinations;
- 32% people said walking was the fastest way to reach their destination;
- The greatest obstacle faced by 68% of the people was the absence of footpaths; 12% were discouraged by heavy traffic;
- 60% of those surveyed used public transport to get to their place of livelihood;
- 67% people used public transit despite owning vehicles;
- 50% IPT operators did not have any basic facilities such as food and sanitation.

- iii. **Traffic Surveys:** The traffic and activity surveys were carried out at various junctions and along several stretches in order to identify the problematic areas and focus points.

Engagement Activities

1. Community Engagement Workshops

For community communication the project was christened “AAPKI SADAK” which translates literally to “your street”, in an attempt to encourage residents to work towards improving their mobility and neighbourhood streets for each other’s benefit and convenience. The workshops adopted a two tier format in which most of the workshops would be focused on generating a constructive and intimate dialogue with sets of residents as one moved along the identified stretch and simultaneously gathered information on personal mobility, perceptions of problem and difficulties and suggestions; followed up by specific issue-based design workshops with selected sets of residents.

Neighbourhood Workshops: These were conducted out in the open in parks of residential areas of various neighbourhoods. 4-5 such workshops were carried out at Bhagat Singh Park.



Figure 20: Bhagat Singh Park Neighbourhood Workshop



Figure 21: Community Engagement Structure

Issues raised at the workshops

- Streets in the area were waterlogged around the year because of water overflowing from people's tanks and the lack of proper drainage and grading.
- The absence of proper IPT to take residents to the metro or bus stop – as auto rickshaws are overpriced and difficult to find due to no proper stand or collection point.
- The reduction/removal of buses as a result of the arrival of the metro has caused great inconvenience, especially since bus services to parts of the city with no direct connection through metro were also taken away.

Thoroughfare Workshops: These workshops were designed for those areas that were abutting thoroughfares and saw heavy traffic of people and vehicles and presented a different level and a greater cross section of users' participation.

Detailed Community Engagement: The detailed community workshops were planned as the name suggests, with more detailed discussions over planning issues emanating from neighbourhood and thoroughfare workshops. Following were the outcomes of the engagement phase:

- The lack of concern of city authorities with respect to the conditions of streets;
- The encroachments by residents, shopkeepers and vendors;
- The lack of footpaths, and convenient and safe passage to the metro station;
- The lack of proper drainage and grading;
- The absence of proper IPT to take older residents to the metro or bus stop;
- The overpricing by auto rickshaws; and
- The discontinuation and disruption in bus services, since the arrival of the metro.

2. Decision Makers Engagement Workshops

A critical component of the engagement process was the constant interaction with decision makers and influential venues. These range from local individuals who exercise a considerable degree of influence amongst the residents and resident bodies, to the Chief Minister herself. Under this process there were several critical events and milestones reached by the team.

Meetings with Local Representatives (RWAs)

- Meeting In Gurudwara Babadeep Singh (to negotiate terms of path to and fro the Metro Station Exit No.3);
- Meeting at Mr. Kakkar's Residence (to explore issues related to all communications made officially and unofficially over the years by the Malviya Nagar Residents' Welfare Association).

Meetings with Authorities

- Meeting with Deputy Chief Architect, DMRC; Associate V. P. Transport Planning, DIMTS; Director UTTIPEC; Governing Body UTTIPEC; Commissioner, SDMC; site meeting with MCD and DDA representatives;
- The outcomes were: (i) stand on parking (paid and designated/dedicated); (ii) stand on encroachments; and (iii) acceptability of the proposals shown.

The outcomes observed were as follows: As suggested above, the meetings with resident bodies proved to be very critical in building trust with the local 'champions', who then took it upon themselves to propagate the findings and rally for the cause. As far as the authorities are concerned, there were again a number of milestones reached, however, the project is yet to be adopted formally by the SDMC, which is keen nonetheless and has agreed to conduct an open house with the residents, to identify a way ahead for execution and to discuss the terms of negotiation mentioned above.

Awareness Activities

Sensitisation Events/Campaigns: The process of engaging with the community, the city, the experts and the masses alike, was carried out more through the medium of art and entertainment than through workshops.

Youth Involvement

Hip Hop Performance: A group of children from Shivalik A block were engaged in a B-Boying flash mob performance.

Cycling Events: In order to interest the residents of the neighbourhoods in NMT options a cycling event was organised through the neighbourhood and other enjoyable and accessible



Figure 22: Stenciling on Walls



Figure 23: Chalo Kyunki Cards

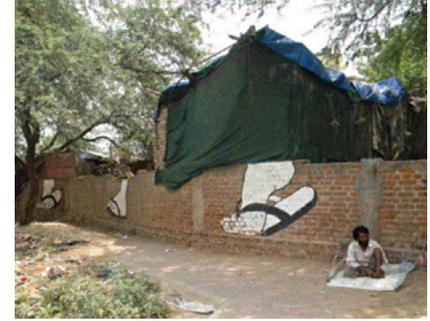


Figure 24: Murals on Wall

destinations around Malviya Nagar. The cycling event was publicised mostly through the “Aapki Sadak” Facebook page.

Street Arts Projects

Stenciling in Hauz Rani: The artists engaged the residents of this area in conversation about the state of mobility and connectivity in the neighbourhood through the process of producing art on the streets, doorways and walls.

Chalo Kyunki Campaign: “Chalo Kyunki...” translated into ‘walk because...’ was coined as a slogan for the project’s pedestrianization campaign.

Inspiring the Next Generation

Art in Parks: This was a huge success as the drawing engaged children and had the indirect result of bringing their mothers to



Figure 25: Hip-hop performance with Neighbourhood Children

the venue of the workshop and participating in it too.

Nukkad Natak/Community theatre workshop: Led by Sukhmani Kohli, the theatre workshop aimed at challenging the hierarchy of road access and encouraging the children to reclaim the public roads and spaces for walking, cycling and play.

Following were the outcomes of the awareness campaigns:

- As the project progressed, it was evident that the popularity of the project and its intended messages were becoming clearer. Residents began designing the logo and came prepared with suggestions, and eventually a set of residents emerged as regular attendees.
- Engaging with the youth was particularly rewarding as it helped establish a dialogue between them and the senior residents, who had until then viewed the youth as just a nuisance. While the senior residents supported pedestrianization strongly, it was actually the youth that demanded cycling infrastructure.

Exhibition and Communication Events

- Public Exhibition at Community Centre, Malviya Nagar:** Held at the Malviya Nagar Community Centre, this exhibition was more focused on the residents at large and their reaction towards the proposals made.
- Aapki Sadak Exhibition:** The project was presented as the first initiative of its kind through an art installation and a play by children to the academic and art community of Delhi.

v. Media and Web Presence

The internet as a means of reaching the target groups, specifically the young has been explored and invested in. Several residents of the Project area are users of Facebook, prompting the formation of a Facebook page to spread awareness of the project and events. Additionally a blog has been set up to provide information about the goals and programme of the project under the “AAPKI SADAK” title.

Results and Impacts

The main findings of the project have been that people are desperate for basic amenities such as footpaths to walk to the market and to the Metro, and that rising prices and sheer unavailability of rickshaws and the reduction of certain bus routes

have severely handicapped people – especially the older generation and children who cannot walk long distances, and are threatened by fast moving traffic. The solutions to these problems involve reconfiguring car parking arrangements and fences to make room for footpaths and cycle rickshaws, which are a cheap and environment friendly option for un-walkable distance in congested areas. Traffic management and easy to use schemes are also featured in the solutions provided by the Aapki Sadak team.

Broad Mobility Plans

While a clearer picture continued to emerge out of the detailed surveys, the socio-economic/user surveys and broader analyses helped the technical experts to determine the basic principles and key macro level strategies that needed to be adopted for the proposals. For this, a BROAD MOBILITY STRATEGY was prepared. The report first defines terms such as Traffic, Mobility and Accessibility to outline the key principles and strategy for this project. It then highlights the need for coordination on between modes to ease access and mobility rather than provide capacity enhancing solutions. It looks into the project area from a larger network point of view and understands the usage typology of traffic in the area and what affects the last mile for the people/residents living in the neighborhood. Finally, it assesses and outlines broad measures and lays down key principles and parameters that could increase walk ability and usage of NMT in the neighborhood.

Community Consensus Plan

The technical surveys and engagement workshops were collated and their observations and conclusions translated into physical design possibilities. A set of guidelines that go along with the physical design has also begun to take shape. These were spatially arranged along with comments and suggestions from the workshops, leading to a map of focus areas and descriptive action strategies that became a work in progress. In that sense, it is a documentation of the residents' demands, in addition to the team's own analysis of the problem areas.

Neighbourhood Improvement Plan

The Neighborhood Improvement Plan (NIP) has been arrived at after discussing the consensus plan with the authorities and stakeholders and fine tuning it based on these discussions. The NIP consists of a complete set of technical drawings along with a rough financial estimate of the project and its components so that the process of adoption might be made efficient. It is clear that the process of Government consultation will continue over a long period of time, with further revisions to the NIP being made as the authorities take up the issues based on the ownership and jurisdiction in the area.

Key Stakeholders and Roles

The collaboration arrangement between the four professional offices of ABLA, SGA, ODI and iTrans, and the varied core competencies they offered was the initial basis of the project. It

was specifically the team's different, niche, technical specializations and the addition of a public art professional for community outreach that imparted a great degree of flexibility and adaptability to the team. These collaborations worked well. There was excellent communication between experts and the structure for group work enabled creative contribution from all participants. The site data and process records that have been gathered together and compiled into a usable resource for future work in the project area, or for other similar projects, is now available.

In order to make full use of local expertise and core competencies in other areas/fields, several collaborations were made during the course of the project. For example the Nukkad Natak as played by school students on the day of the final exhibition became the perfect opportunity for collaborations with multiple organizations. Swechha, an NGO based in Malviya Nagar helped provide a venue for children to practice the Nukkad Natak, while Purple Mangoes helped create the script for it and trained the children and Swarna Public School enrolled a number of their students for the exercise. Such collaborations formed the backbone of a thoroughly participatory process which in turn empowered the local 'champions' and organizations. KHOJ accommodated the final Exhibition and the team is currently seeking collaboration with Wiser.org to improve outreach among the local youth.

Enabling environment/Barriers Neighbourhood Specificity

It is found that each neighborhood is peculiar in its specific layout and its evolved pattern of use – planned or unplanned, level of residential density and commercial activity, vehicular ownership and vehicular traffic.

The pressure of traffic on existing rights of way is a function of the above factors as well as of the connectivity of the neighborhood streets to the surrounding city level traffic network. Introduction of pedestrian and NMT corridors with connectivity to public transport and reducing air and noise pollution requires a neighborhood specific traffic regulation strategy and traffic direction to reduce through traffic in residential neighborhoods.

Limitations of Design Standards

It must be understood that each street stretch and junction calls for its specific design. Text book standards may not be feasible at all locations, and if applied literally, do not address the local requirement optimally. It is more pertinent to institute design principles or design guidelines supported by design examples.

Detailed physical survey and consultation with residents is, therefore, a prerequisite for appropriate design. An appropriate response to neighborhood specificity calls for a coordinated exercise of survey, consultation and design, where the design agency has the authority and competence to incorporate all aspects of physical infrastructure of the street or public space in the design.

Local Area Planning & Development Controls

The recent move to implement the 73rd and 74th Constitution-

al Amendments, requiring Local Area Plans to be prepared for each municipal ward of the city is opportune. Detailed surveys have revealed several instances of land designated for specific uses under the Master Plan lying derelict and/or under-utilised. It will be necessary to enable the Local Area Plan to re-align/re-allocate Master Plan land use in order to meet local needs. A transitional arrangement for car parking using such lands will be greatly advantageous till the transportation and car ownership and parking policies take effect. Alignment of cycle tracks and pedestrian pathways along or through public parks, a practice followed commonly, requires that these are not interpreted as an infringement of the public park area or an intrusion of "traffic" into the park space. These call for enabling guidelines and clarifications to be issued by the competent authorities.

Car Parking

The car parking policy for existing parking within residential areas where car population is growing or its growth is anticipated requires a distinct strategy. The policy of restricting parking by demarcation and pricing is not applicable to residential zones.

A car parking policy for existing residential areas where cars cannot be housed within the properties requires a policy of progressive, step-by-step actions to reduce dependence on motor cars. In the long term, residents are willing to pay for a managed parking service located at a walking distance from home. Parking provision will necessarily need to be on public or commercial land, since parking space is not available within most residential properties. Priced parking, combined with the experience of improved neighborhood environments and better connectivity to public transport will require to be taken up as coordinated neighborhood level infrastructure provision. It is possible to imagine that car ownership would then reach a plateau.

As residents have invested in motor cars with many households own more than one car, their expectation is that pedestrian and NMT access will not reduce available car parking space. They do not mind paying for organized parking which may be either collectively managed or contracted out by the SDMC. They expect that the parking space is close to home. Designing and managing this process requires sensitive handling. The challenge is to create a perception of overall improvement in the neighborhood street environment as a desirable compensation for re-organised parking. Reduction in parking provision from present levels would not be acceptable.

Consultative Process

An independent, technically competent agency, which is neither governmental nor a profit seeking contractor, would have the trust of residents. Residents also require this agency to be taken seriously and positively by the local authorities. The credibility and status of the donor agency plays a key role. A face-to-face communication mode with transparency and consistency is critical in winning this trust.

It was seen that the informal, open ended structure for consultation meetings was more valuable than meetings with "official"

representatives. The perceptions and views of the ordinary citizen, women, children and the elderly often determined consensus priorities. Official representatives were often unable to articulate the varying perspective of the ordinary citizens in an unbiased manner.

Neighbourhoods

Neighborhoods tend to have territorial instincts, be inward looking and protective of their own territories, suspicious of their next door communities, especially if they are of another social class. This causes divisions. The other divide is between residents and commercial establishments intruding into residential zones. Generally, the perception is that commercial greed is creating congestion and illegal encroachments. There is a tendency to conflate prescriptions with needs.

It is seen that these negatives are overcome when conflicts and needs are addressed through consultation along with optimal design solutions being proposed. Generating an environment of cooperation across the divides and a social expectation of disciplined behavior requires the involvement of local champions. This is difficult to sustain over long periods of time.

Local Institutions

From the point of view of mobility, other than residents, local institutions have a significant bearing. Educational establishments – schools, colleges, training centers, small and large hospitals, places for religious and social congregations are generators of periodic congestion on the street. Equally they require efficient and safe access for their users. Their participation, particularly in finding traffic management and mobility alternatives is critical. These form a separate constituency. Access to them is controlled by strong hierarchies and they are less amenable to open ended discussion with their students, teachers and employees. Institutions that voluntarily came forward were exceptions to the rule. Their participation and cooperation is more likely if it were instructed by their respective licensing authorities.

Youth

Ironically, the local youth were an underrepresented category during consultations and public events. This may be due to their stakes in their residential locality being relatively less than the stakes for owners and more housebound groups. Alternative strategies are needed to ensure their participation and involvement.

Inter Departmental Coordination

In New Delhi there are multiple jurisdictions – DDA, MCD, and PWD – with independent verticals operating in most zones. The various city services, e.g. traffic management, drainage, water supply, are also independent arms. Urban improvement projects require a coordinating agency with the requisite authority to instruct coordination between stakeholders and service providers. In the case of this project, it was fortunate that UTIPEC under the chairmanship of the Lieutenant Governor of Delhi decided to adopt the project.

While this challenge has been addressed fortuitously in this project, in the long term, this authority is to be established with the Municipality. It would be the local body charged with giving effect to the 73rd and 74th Constitutional Amendments.

Key Lessons, Continuity and Replicability

a. Project Positioning for Political and Governmental Support

The project has reached a threshold of being actionable. Its benefits and potential is appreciated and it is seen to be doable and worth getting started on by the Local Body as well as residents. It is now necessary to position the project at a higher political and governmental platform. SDMC is already moving to budget for execution of the works in the coming financial year. It is proposed that the project be formally presented to and be endorsed by MoUD, the DDA, SDMC and the Government of the Union Territory of Delhi. This will ascribe the required status to the project and encourage cooperation all round.

b. Professional Support for Project Identification and Implementation

Within the limitations of the present pilot project the overall methodology has been constructive and productive. The Municipal Corporation South Zone is accepting in principle ownership of the project. It would also require technical support in technical design and coordination as construction works are undertaken.

c. Extension of Improvement Plan to Cover Contiguous Neighbourhoods Bounded by Arterial Roads

The present project has been a pilot to test and develop the consultative and design methodology by taking a limited area of intervention which is fairly representative of city neighbourhood mobility issues. It was also a test to establish a working link with the concerned governmental agencies and to prepare the ground

for acceptance of the project for implementation. This has been achieved. Now, for full effectiveness and success of the proposed improvement plan it is essential to extend and integrate it with solutions for the linked main streets of the neighbourhood, specifically – Malviya Nagar Market Street and the street connecting Khirki Village to Savitri Nagar. The larger zone, bounded by the arterial roads and connected to the three Metro Stations and bus routes calls for a comprehensive implementation of street improvement to ensure success. Residents have also requested that the improvement plan should take care of the linking streets which are areas of congestion and great discomfort at present. In their perception effective improvement of local mobility is locked with access up to the MRT corridors and Metro stations that surround the zone.

Parking arrangements and pricing strategy, which has turned out to be a key factor has to be devised for the zone as a unit. The zone taken as a whole also becomes amenable to a parking management plan being implemented.

d. Capacity Building for City Improvement

In parallel, it is strongly recommended that with an extension of the project to cover the full zone, the opportunity of the project process be used to institute a design cell within South Delhi Municipal Corporation, which is trained to survey, design and provide oversight of coordinated implementation of street improvements. This would be a critical and necessary step in capacity building of municipal services.

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RAAHGIRI DAY: OUR STREETS - OUR FREEDOM

SNAPSHOT

Name	Raahgiri Day
City	Gurgaon, Haryana
Duration	Every Sunday starting from 17th November, 2013
Current Status	Being implemented on every Sunday. This initiative is now operational in other Indian cities as well (Delhi, Ludhiana and Navi Mumbai)
Brief Description	Temporary closure of a network of streets to cars so that they become "open" to people, Raahgiri Day is a weekly road event which started from 17th November 2013 and takes place thereafter on every Sunday

Project Description

In a quest to make Gurgaon accessible to its residents and encourage the use of cycling, walking and public transport in the city, organisations and activists of Gurgaon have come together to execute a novel concept. The idea was adopted from the Cyclovia event in Bogota. It is India's first sustained car-free day. Launched in Gurgaon - India's "Millennium City" - on November 17, 2013, the event closes 4.5 kilometers (2.8 miles) of major streets to automobiles every Sunday from 7:00 am to 12:00 pm and opens them up for recreational and community leisure activities.

Raahgiri Day is a weekly street event which provides citizens with the opportunity to reclaim their streets, connect with their community, celebrate their city and therefore reclaim their lives. The streets of Gurgaon are set aside for citizens to come together in large numbers for recreation that promotes health, well-being, fitness, togetherness and joy.

Strategic Intervention

Complete ban of usage of cars on identified stretches in the city and also blocking the roads by conducting some recreational events throughout the day on these identified stretches. It encourages the usage of non-motorised transport. There is ample parking at various points along the route including Leisure Valley Park, HUDA City Center Metro station, Galleria Market and Iffco Chowk Metro Station where the cars could be parked and people can go around the streets to participate in the events.

Type of Measures

It is a long term measure which requires a huge level of public participation and coordination between the Municipal Corporation of Gurgaon, PWD, HUDA and Traffic Police. It also needs engagement of private sector agencies for organising the

events and publicising and also funding them. Raahgiri Day was catalyzed by EMBARQ India, IamGurgaon, Pedal Yatri, Heritage School and Duplay's with support from District Administration and Gurgaon Police.

Key Objectives of the Initiative

1. Promote cycling, walking and use of Public Transport as envisaged in the National Urban Transport Policy and Integrated Mobility Plan for Gurgaon;
2. Re-state and remind its citizens that the streets belong to the people;
3. Promote healthy living by encouraging an active lifestyle;
4. Create an inclusive community and promote and facilitate social integration; and
5. Promote and highlight environmental issues/concerns.

Implementation Process

Children and adults are invited to bike, skate, run and walk; to partake in community leisure activities such as street games, street dancing; to learn yoga, aerobics and zumba (for which stages will be set up at intervals along the route); and to come together as a community and celebrate life.

The success of the initiative owes to the well managed coordination between the governing agencies and the involvement of private sector agencies in conducting the event. Also, the willingness of the community to make their surroundings livable and safe was brought about by highly publicizing the benefits and people participation.

Outcome

- There has been a remarkable impact on road safety at the Raahgiri stretch since the event has begun. During a recent survey conducted by EMBARQ India, it was found that there

were 5 road fatalities in the Sushant Lok area from Jan-Oct 2013. However, since the event began in November 2013, this number has come down to zero. These statistics speak a lot about the potential that this initiative has to make our roads safer. This has also to do with the phenomenal support and participation from Gurgaon Police, who conduct activities at Raahgiri Day every Sunday to generate awareness around road safety.

- Another unexpected outcome of Raahgiri Day is the increase in bicycle sales in Gurgaon. As per the surveys conducted EMBARQ India, 28% of respondents said that after experiencing cycling on Raahgiri Day, they now own a bicycle; 59% said they now cycle/walk to the Raahgiri venue, while a substantial 87% said they now cycle/walk to cover shorter distances.
- According to the survey, 31% people said that they came with friends, and 53% said that they came with their families. For a city like Gurgaon, which is dominated by condominiums and huge segregated private properties, Raahgiri Day gives residents an opportunity to meet and greet new people and has instilled a sense of belongingness amongst them.
- Raahgiri Day has also had a significant impact on noise and air pollution in the event zone, directly impacting the quality of life of people.

Replicable Aspects of the Intervention

This low cost initiative has the potential of being replicated easily in all towns and cities. It requires focused planning by identifying stretches which have high pedestrian volume along with commercial activities. Parking lots near the stretch need to be recognised and well connected through NMT modes or walking tracks. The governing agencies, enforcement agencies and private sector operators need to be convinced about the benefits this scheme would generate in terms of revenue,

environment and community participation.

Raahgiri Day began by blocking 4.8 km of roads in the city. However the encouraging turnout every Sunday and numerous requests from citizens soon got the authorities and founding members thinking about its expansion. Therefore the route was first expanded to 11.5 km and then to 14.5 km following the Cyclovia model, which today has a 120 km path being blocked every Sunday.

Inspired by Gurgaon, enthusiastic citizens in other parts of the country are also following suit. One such city is Ludhiana where a 13 year old school girl, after going through the Raahgiri Day Facebook page, got inspired by what was happening in Gurgaon. She encouraged her friends and teachers at school and her family to start a similar movement in Ludhiana, making Ludhiana the first city after Gurgaon to have implemented sustained car-free Sundays. The other city that has implemented Raahgiri is Navi Mumbai. But the biggest leap for the movement is scaling it from a city of 800,000 (Gurgaon) to a city of 22 million. Raahgiri Day was launched in Delhi on July 13, 2014, as a part of which the inner circle of Connaught Place and various radial roads leading to the inner circle were blocked. The initiative since then, has witnessed increasing number of participants on each Sunday.

Source of Information

- www.raahagiriday.com
- <https://www.facebook.com/RaahgiriDay>
- <http://timesofindia.indiatimes.com/city/gurgaon/Raahgiri-leads-the-world-by-example/articleshow/35913867.cms>
- Details provided by:

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CATEGORY 6

LAND-USE & TRANSPORT INTEGRATION

Transportation and land use planning decisions overlap. Transport planning decisions affect land use development, and land use conditions affect transport activity. These relationships are complex, with various interactive effects. It is therefore important to understand these in order to integrate planning, so individual decisions support strategic goals. The most common example of this interaction is the difference in travel patterns between the two typical urban models of concentric development (centrally located business district) and multi nuclei development (multiple commercial centers distributed throughout the city). Transit oriented development (TOD) is another example of how integrated planning of land use and transportation can be used to reduce the need for travel.

Although most land use factors have modest individual impacts, typically affecting just a few percent of total travel, they are cumulative and synergistic. Integrated smart growth programs can reduce vehicle ownership and travel by 20-40%, and significantly increase walking, cycling and use of public transit, with even larger impacts if integrated with other policy changes such as increased investments in alternative modes and more efficient transport pricing.

A number of cities have begun to look at the concept of TOD and its benefits as per the context. It is being implemented in Pimpri Chinchwad along its BRTS corridors, has been planned for in the Delhi Master Plan 2021 along MRTS (metro corridors) and is being studied for suitability in Naya Raipur which is an almost greenfield development and can benefit greatly from an early stage TOD which would limit sprawl to a large extent. Similar initiatives have been listed in the table below.

Convinced by the inherent demerits of the Town Planning Scheme process, Ahmedabad Urban Development Authority initiated a number of innovations and persuaded the Government of Gujarat to amend the Gujarat Urban Development and

Town Planning Act, 1976 in 1999 to revitalise and expedite the TP Scheme process. The amendments to the TP Act led to the proposed area being developed through a well-planned TP Scheme with proper civic amenities before people start living in the area, curtailing haphazard growth, illegal developments with improper road network connectivity, water supply and sanitation facilities. To illustrate the merits of this initiative, **Prahlad Nagar Town Planning Scheme** has been included as a detailed documented project in this section.

In this Transit Oriented Development model, Pimpri Chinchwad Municipal Corporation is promoting high density development next to the high capacity transportation system. PCMC has identified 100 m on either side of the BRT corridors as the BRT influence zone. PCMC provides 80% higher Floor Space Index (FSI) of 1.80 in the BRT influence zone. The model for densification of PCMC is unique and very different from the FSI bank or sale of incremental FSI schemes of other cities in the country. PCMC's model allows loading of Transfer of Development Right (TDR) into the BRT influence zone. Details of this initiative have been provided as a snapshot in the subsequent section.

S. No.	Name of the Project	Location
1	Prahlad Nagar Town Planning Scheme	Ahmedabad, Gujarat
2	Transit Oriented Development around BRTS corridors in Pimpri Chinchwad	Pimpri Chinchwad, Maharashtra
3	Transit Oriented Development as part of Delhi Master Plan - 2021	Delhi
4	Naya Raipur TOD Study	Naya Raipur, Chhattisgarh

PRAHLADNAGAR TOWN PLANNING SCHEME

Abstract

The Town Planning Scheme Mechanism in Ahmedabad is seen as a participatory and equitable means of acquiring land owners on the urban fringe. A form of land readjustment, it allows local authorities to acquire a proportion of all the land parcels in a defined area on which to build public roads, parks, and other amenities. The authorities return remaining land to the original land owners in the form of reconstituted parcels which have increased value due to the improvements. The landowner pays half of this increase in land value to the Government as a betterment charge, which helps the government while also expanding urban infrastructure. Proponents often claim that the TP Scheme mechanism is a 'win-win' proposition.

Background

The basic concept of Town Planning Schemes is pooling together all the land under different ownerships and redistributing it in a properly reconstituted form after deducting the land required for open spaces, social infrastructures, services, housing for the economically weaker section, and the road network. This process enables the local authority to develop land without fully acquiring it and gives it a positive control over the design and the timing of the urban growth. This method is extensively practiced in Gujarat and Maharashtra, selectively in Kerala and occasionally in Andhra Pradesh and Tamil Nadu.

To achieve the ultimate objectives of the Development Plan, Town Planning Schemes are prepared with the help of micro-level planning for smaller areas of about 100 hectares that are already under pressure of urban development. Town Planning Schemes are conceptualised as a joint venture between the local authorities and the owners of the plots who voluntarily agree to pool their land, redistribute that land amongst them and share the development costs.

The total area of the Prahlad Nagar project is 162 hectares. In the 1987 Development Plan, this land was reserved for housing to be developed by the Gujarat Housing Board. In the current plan it has been de-reserved. Four Town Planning Schemes have been prepared to cover the area. They are however, being taken together as one project for implementation. At an average density of 150 persons per hectare, the project area may accommodate a population of 24,300. Going by trends in nearby localities, this density may increase to a saturation level of 400 persons per hectare by 2020. At this stage the population is estimated at around 64,800.

The project area had 297 plots. These "Original Plots" have been reconstituted into 286 "Final Plots". All the Final Plots have

approximately 52% of the area of the original plots. The 48% land thus freed up by the reconstitution has been used to provide roads, land for social amenities and land for resale by AUDA to recover the cost of infrastructure provision.

Need for the Project

Ahmedabad is Gujarat's largest city, and it is growing rapidly. Its population is estimated to have increased from 2.5 to 6.5 million people between 1981-2011 (AUDA and AMC 2006). The physical expansion of the city to accommodate this population growth was to be achieved by a suitable mechanism of land allocation.

Due to the rapid pace of urbanisation in the city, the city was characterised by chaotic growth and inadequate resources for infrastructure. The major issues were inadequate land for the construction of roads so as to create better connectivity. There was also a data constraint of insufficient planning data to carry out the planning process. The Prahaladnagar TP Scheme was undertaken as a model development to demonstrate the merits of the revitalised TP Scheme process. AUDA believed the project could be a model not only for development agencies in Gujarat's cities but for agencies in other cities that are striving to provide well planned and adequately serviced land for rapid urban growth in a fair and equitable manner.

The current Act, which is the Gujarat Town Planning and Urban Development Act, was introduced in 1976, and came into force from February, 1978. In this Act, the physical planning of a TP Scheme was separated from its financial aspects and also the process was divided into three stages - Draft Scheme, Preliminary Scheme and Final Scheme with a view to expedite the process. This principal Act had the major negative points:

- Lack of a fixed time limit for the completion of the scheme.
- Inability to acquire land for construction or roads till the Final Scheme was sanctioned.

Convinced of the inherent merits of the TP scheme process, AUDA initiated a number of innovations and persuaded the Government of Gujarat through the Gujarat Urban Development Authorities Association to amend the Gujarat Town Planning and Urban Development Act, 1976 in 1999 to revitalise the TP Scheme process. The initiatives undertaken included:

- A provision to complete the entire process of TP Scheme preparation and finalisation in a period of 27 months.
- The possession of land for roads being enabled as soon as the Draft Scheme is sanctioned. This arrests haphazard growth

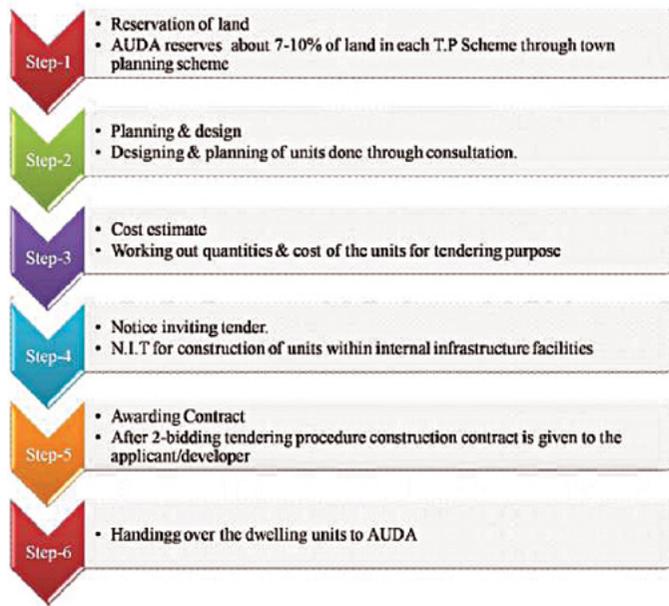


Figure 26: Steps for Town Planning Scheme Process

and allows for faster implementation of the scheme in terms of construction of roads and infrastructure.

Project Description

The project was basically conceived for the preparation and implementation of town planning schemes with use of new and advanced technologies so as to bridge the data gap. Use of total station survey was conducted right at the start for upcoming town planning schemes and computerised preparation of town planning schemes was also undertaken along with provision of sufficient infrastructure and connectivity so as to increase the value of land and also give an aesthetic sense of living to the people. Following are the steps followed in the town planning scheme process:

Prahladnagar is located in the southwest corner of Ahmedabad adjacent to the Sarkhej-Gandhinagar Highway. It is bordered on the west by the highway and on the east by the railway line to Dhandhuka. Prahladnagar will serve the housing and social infrastructure needs of industrial development that is already taking place in the southwest part of AUDA and adjacent areas outside AUDA. The Sarkhej-Gandhinagar highway is poised to become a major commercial and institution artery of Ahmedabad.

The layout of Prahladnagar was envisaged as an integral part of the fabric of the city as conceived in the Development Plan. The first step was therefore to fix the precise alignment of the city level roads proposed in the DP and passing through the project area. The internal street layout has been designed keeping in mind basic principles such as establishing proper hierarchy of roads, ensuring alternate routes for traffic and achieving proper geometry of junctions. Proposed social amenities such as parks and schools have been located so as to minimise walking distance within the project area.

When original plots are reconstituted into final plots in a Town Planning Scheme, some land is deducted by the Development Authority, for which the owner is eligible to get compensation at the prevailing market price of undeveloped land. When the development authority makes infrastructure investments such as roads, streetlights and sewer lines, the value of the final plot appreciates. Since the value appreciation is a result of the investments made by the Development Authority, the owner has to contribute a share of the increment in land value. This is known as “Incremental Contribution”. The difference between Incremental Contribution and compensation for a plot is due to be paid by the owner of the Development Authority and vice versa.

In this particular project, AUDA started implementing the scheme at a faster rate to promote development. AUDA took possession of land and constructed roads with street lighting on priority basis. This encouraged the developer to develop their lands in this area. While giving development permission with mutual consent, the reconstituted plots were given to respective land owners and the land allotted to AUDA for different purposes was taken by AUDA. On these land parcels, AUDA started developing gardens, percolating wells, and other social services, wherever possible.

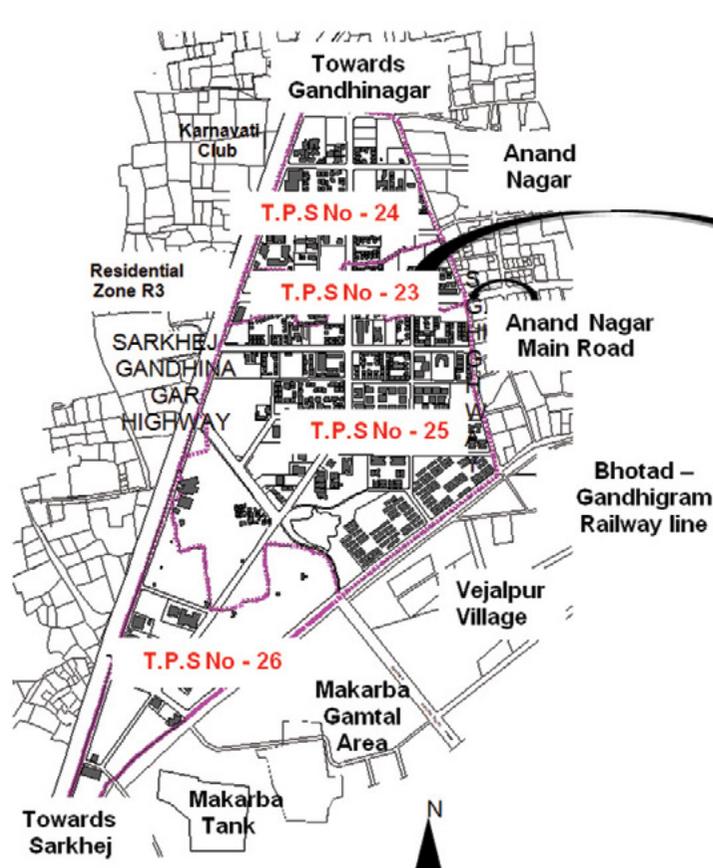
Guiding Policy Document/Act/Notice

The Town Planning Scheme mechanism was first introduced under the Bombay Town Planning Act of 1915. The first TP Scheme for Ahmedabad was prepared in 1917, for Jamalpur. The Gujarat Town Planning and Urban Development Act (GTPUDA) was passed in 1976 which emphasized the regional approach to planning with creation of Development Authorities, such as AUDA, to manage the growth of the entire metropolitan regions. The process of preparing TP Schemes in Gujarat was split into three stages, with each of the three - the Draft Scheme, Preliminary Scheme, and Final Scheme - requiring approval by the state government. In order to address the long delays that regularly occurred as financial matters were resolved, the GTPUDA “de-linked” physical and financial considerations. This allowed implementation to begin once the physical layout had been decided upon, without waiting for financial matters to be sorted out.

Amendments in the Town Planning Act

Situation before the Initiative

- While at the macro level, the Development Plan was meticulously drawn, at the grassroots level, either the TP Schemes were not drafted at all or there was delay in implementation.
- The Gujarat Town Planning And Urban Development Act was introduced in 1976, and came into force from February 1978. In this Act, the physical planning of a TP Scheme was separated from its financial aspects and also the process was divided into three stages with a view to expedite the entire process - Draft Scheme, Preliminary Scheme and Final Scheme.
- The Act had three major drawbacks:
 1. Lack of a fixed time limit for the completion of the Scheme.



Source: Draft Development Plan of AUDA

Figure 27: Location of Prahladnagar, Ahmedabad

2. Inability to acquire land for construction of roads till the Final scheme was sanctioned.
 3. Inadequate financial resources in the form of betterment charges that came from the landowners only after the Final Scheme was sanctioned.
- Surveys carried out before the introduction of table survey method were found to be inaccurate and caused problems during later stages of the TP Scheme process.
 - Land acquisition for roads became feasible only after the Government gave final sanctions to TP Schemes. Settlement of legal disputes generally took long to resolve, putting implementation way behind schedule.
 - Recovery of cost of providing infrastructure through levying betterment charge was not viable.
 - There was no stipulated time limit for the completion of the scheme. As a result, only 18 TP Schemes were prepared and implemented during the 21 years spanning 1978 to 1999.
 - Also, as a result of delay in finalisation of TP Schemes, haphazard and irregular growth took place preceding implementation of TP Schemes.

The Initiative/Innovation

- Convinced by the inherent demerits of the TP Scheme process, AUDA initiated a number of innovations and persuaded the Government of Gujarat to amend the Gujarat Urban Develop-

ment and Town Planning Act, 1976 in 1999 to revitalise and expedite the TP Scheme process. The Government of Gujarat has supported these reforms.

- These amendments include:
 1. Provision of a clause to complete the entire process of TP Scheme preparation and finalisation within a period of 27 months.
 2. The possession of land for roads is possible 15 months after the publication of "Declaration of Intention" to prepare the scheme. During the intervening period the Draft Scheme is sanctioned. This arrests haphazard growth and allows faster implementation of the scheme.

Project Implementation Methodology of Preparing Prahladnagar Town Planning Scheme

The layout of Prahladnagar was prepared as an integral part of the fabric of the city as conceived in the Development Plan. The first step was therefore to fix the precise alignment of the city level roads proposed in the DP and passing through the project area. The project area originally had 297 plots. These "Original Plots" have been reconstituted into 286 "Final Plots". All the final plots have approximately 52% of the area of the original plots.

The internal street layouts have been designed keeping in mind basic principles such as establishing proper hierarchy of

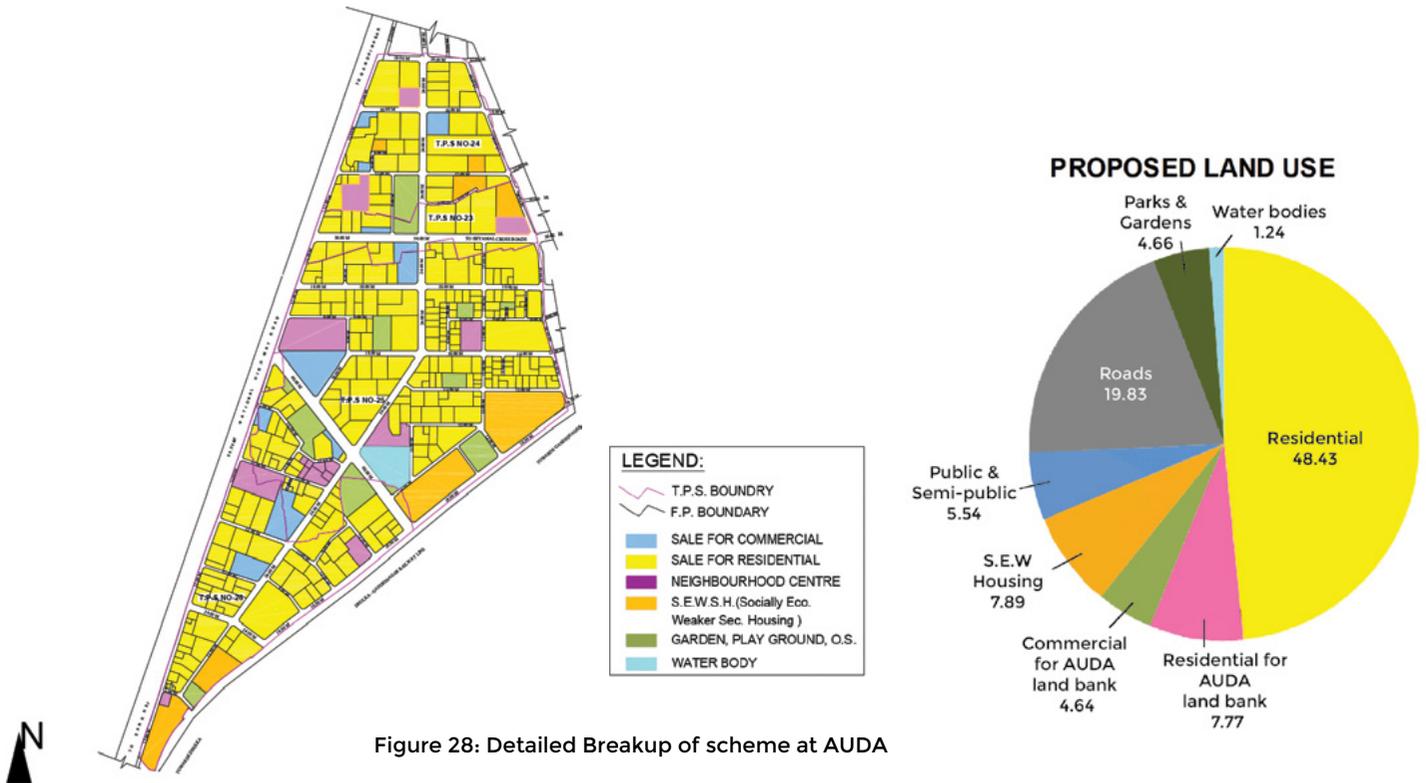


Figure 28: Detailed Breakup of scheme at AUDA

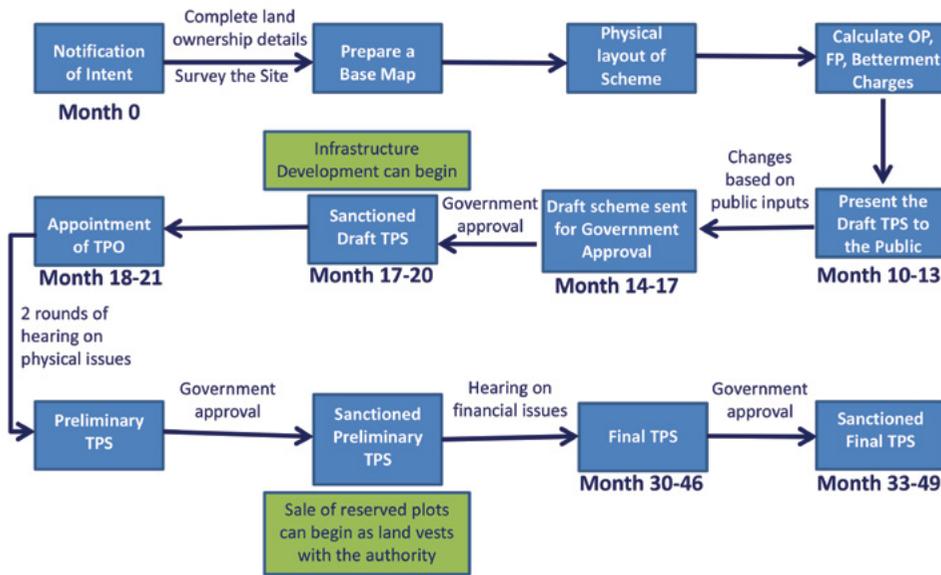


Figure 29: Town Planning Scheme Process in Gujarat

roads, ensuring alternate route for traffic and achieving proper geometry of junctions. Proposed social amenities such as parks and schools have been so located as to minimise walking distances within the project area. The 48% land thus freed by the reconstitution has been used to provide roads, land for social amenities and land for resale by AUDA to recover the cost of infrastructure provision. The detailed breakup of the proposal of the scheme is as follows:¹

At present the construction of major roads, provision of

TABLE 7:
BREAK UP OF PRAHLAD NAGAR T.P SCHEME

T. P. Scheme No.	Village	Area (Hectare)
23	Vejalpur	13.6
24	Vejalpur	27
25	Vejalpur	83
26	Makarba	37
Total Area		160.6

¹ Implementation of Development Plan by legal tool of the Town Planning Scheme (A case of AUDA), Memnagar TPO Office AMC.

streetlights, tree plantations, development of gardens, rain water harvesting systems, laying of sewerage lines within the scheme area is already complete within three years' time span. The demarcation of final plots has also been carried out by the owner itself.

Construction of TPA Scheme

The TP Scheme is a really efficient tool for urban land development in Ahmedabad which provides serviced land to the private sector and reserves public purpose land which is useful for the physical and social infrastructure development of the area. Generally the land deduction of original land is about 35-40 % in the TP Schemes and 60 % of the original plot is returned to the plot owner. Recently AUDA has announced a total no. of 55 new TP Schemes to be finalised in the peripheral areas of Ahmedabad City as per the City Development Plan within 1 year of time period.

Results and Impacts

- Land acquisition for roads can now commence soon after the draft TP Scheme is approved, AUDA can then apply betterment charges etc. to generate finances and take care of infrastructure provision. This modality has wide acceptance now.
- As compared to the slow progress of the previous 21 years, 48 TP Schemes (with a total land area of about 5,000 hectares) have been planned during the brief post amendment 3-year period from 1999 till date.
- The average time for implementation of the TP Scheme has decreased due to these amendments. As a result of these new measures, people willingly co-operate with AUDA and support the implementation of TP Schemes by providing land for roads and other public facilities.
- Infrastructure facilities are now available ahead of implementing the schemes that are progressing as per schedule. New growth is therefore taking place in a planned manner.
- Finances for providing infrastructure in a TP Scheme are now available with AUDA soon after the declaration.
- At present the construction of major roads, provision of streetlights, tree plantations, development of gardens, rain water harvesting systems, laying of sewerage lines within

the scheme area is already complete within three years' time span.

- All the final plot demarcations are also carried out by owner itself and approximately 50-development permissions have now been issued.

Key Stakeholders

The key stakeholders of this initiative include Government of Gujarat, Ahmedabad Urban Development Authority and the residents who had land under the town planning scheme.

Enabling environment/barriers

- The amendments in the TP Act lead to sustainable development as the proposed area under development is being developed through a well-planned TP Scheme with proper civic amenities before people start living in the area, curtailing haphazard growth, illegal developments with improper water supply and sanitation facilities. It also ensures timely completion of TP Scheme implementation.
- However, there is no clear mention in the amendments about the actions that could be taken if the entire process of TP Scheme preparation and finalisation is not completed within a period of 27 months.
- Other states can adopt similar legislation to introduce reforms and carry out amendments in the existing development control mechanism and regulations to improve the process of planned development.

Key Lessons

- Urban local bodies should ensure that periodical reviews of governing acts/regulations are done.
- Pro-active initiatives can activate problem-solving leading to greater satisfaction of stakeholders.
- Developing TP Schemes through proper planning by Urban Local Bodies ensures public satisfaction.

Contact Details of Concerned Official

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PIMPRI CHINCHWAD MUNICIPAL CORPORATION TRANSIT ORIENTED DEVELOPMENT INITIATIVE

SNAPSHOT

Name	TOD around BRTS corridors in Pimpri Chinchwad
City	Pimpri Chinchwad Municipal Corporation
Duration	Three Phase Project: 1) 2010-2014, 2) 2015-2019 and 3) 2020- 2024
Current Status	PCMC has constructed BRTS infrastructure along 1 corridor and construction on other 3 is in progress.
Brief Description	In this TOD, PCMC is promoting high-density development next to high capacity transportation system. PCMC has identified 100 m on either side of the BRT corridors as the BRT influence zone. PCMC provides 80% higher FSI of 1.80 in the BRT influence zone. PCMC's model allows loading of TDR into the BRT influence zone.

Project Description

Pimpri Chinchwad Municipal Corporation (PCMC) is developing 130 km of a BRT corridor, with pedestrians and cyclists along with infrastructure amenities to support high population densities, across Pimpri Chinchwad. PCMC will catalyze spatial development of the city through this project and planned investments in improving mobility, rather than catch up with rapid-city development.

Strategic Intervention

PCMC is promoting TOD around the BRT corridors to encourage public transport use by maximising access to public transport and encouraging transit ridership. Through this development model, PCMC aims to decrease traffic congestion by promoting existing private vehicle owners to shift towards public transport and protect natural areas by preventing sprawls and encroachment on natural areas. Mix use development under the TOD model will also help maintain transit use at all times of the day, provide excellent pedestrian facilities and lead to reduction in need for parking of personal vehicles.

Type of Measure

The project cost for the first phase is about Rs. 1540 crore, which is being financed by GoI and Government of Maharashtra (GoM) under JnNURM (Rs. 475 crore), loans of about Rs. 690 crore from DFIs/Multilateral Banks (ADB and the World Bank), and the rest Rs. 375 crore by PCMC. Complementary PPP models for the project are also conceived to provide for bus stops, public toilets, landscaping, general maintenance and advertisement rights.

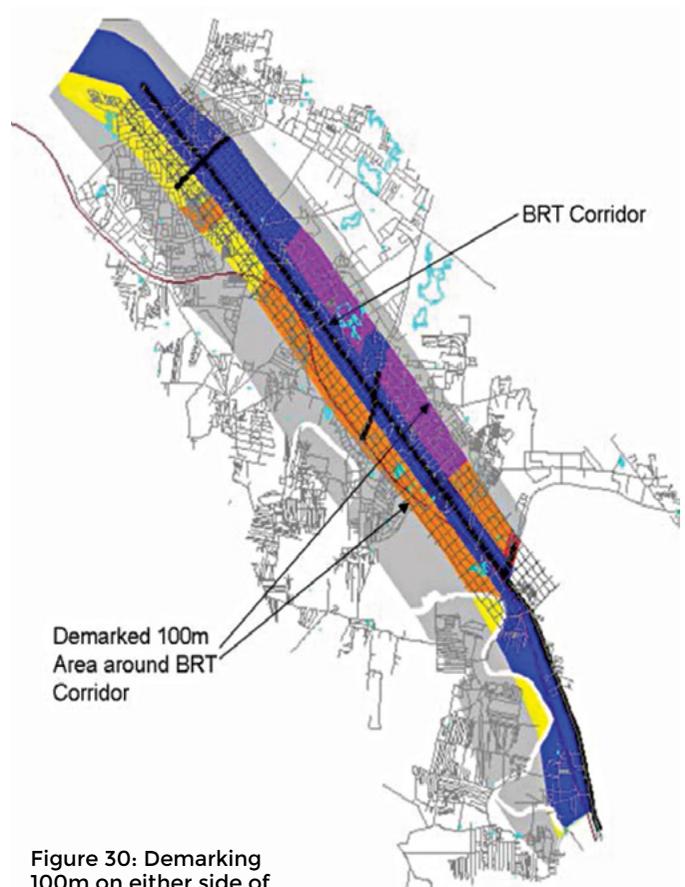


Figure 30: Demarking 100m on either side of the BRT Corridor

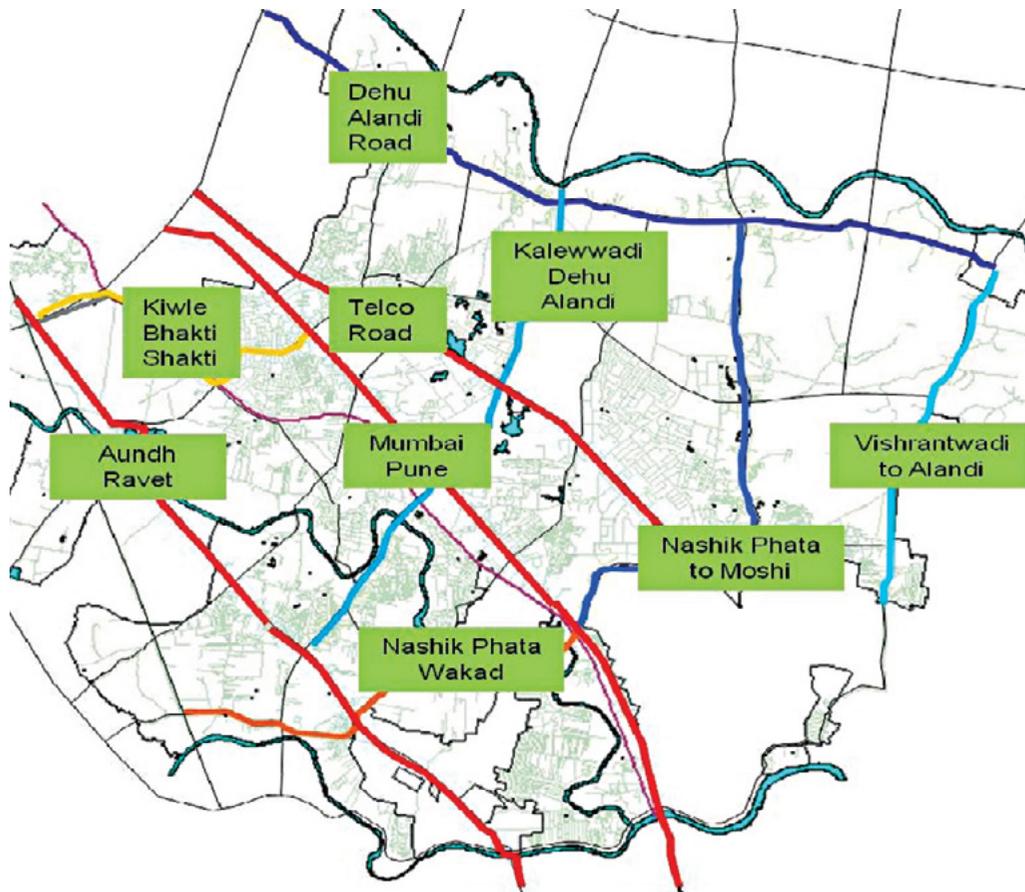


Figure 31: Road Network at PCMC

PCMC has set up an Urban Transport Fund (UTF), managed by an SPV, PCMC Infrastructure Company Ltd (PICL), to finance its share of the BRT project and develop infrastructure along the BRT routes, which includes providing sanitation, water and other civic amenities to people living along the BRT corridor. Accordingly, 100 metres on both sides of the corridor have been earmarked as the “BRT Influence Zone”, and various instruments are used to capture part of the incremental value from the influence zone. The financing instruments are:

- Premium charged on loading TDRs in the influence zone;
- Development charges in the influence zone;
- Incremental taxes as the influence zone is designated as a high property tax zone; and
- Other sources, such as leasing Utility ducts, and advertisements.

In this project, the TDR mechanism has a dual objective of densification of BRT corridors for orderly spatial development and generating revenue by capturing the benefit of increase in land and real estate value in the proximity of the BRT corridor to part finance the development project. Considering that densification of the influence zone is essential for project sustainability and generating revenues for the UTF, PCMC has raised the FSI in the influence zone from 1 to 1.8 with the added FSI of 0.8 being achieved through loading of TDR. TDRs can be generated

anywhere in the city and applied in the influence zone, subject to some restrictions. The PCMC area is divided into zones A, B, C, where A is most congested, and C is least developed. A premium (which is like a one-time tax) is charged for using TDR in the influence zone according to originating TDR zones as per the proposed rates of Rs. 300/600/900 per sq. ft for originating zones A/B/C. The rationale for gradation of the premium is based on incentivising movement away from congested zones, which therefore have lower premium (“tax”).

Implementation Process

Implementation is based on FSI-linked land use control, and the infrastructure financing mechanism and development is structured on a PPP basis. PCCI will construct, operate, and maintain the BRTS corridors through funds generated by the UTF. The UTF has been assigned revenues viz., premium for loading TDR development charges for building permission, incremental property tax, advertisement rights, lease on utilities ducts, etc. Diversifying incomes to the UTF involve raising debt funds from the World Bank, ADB and other lending agencies for funding and construction of BRTS corridors.

Outcome

This model is expected to spur real estate development in and around the TOD area and will provide additional direct benefits

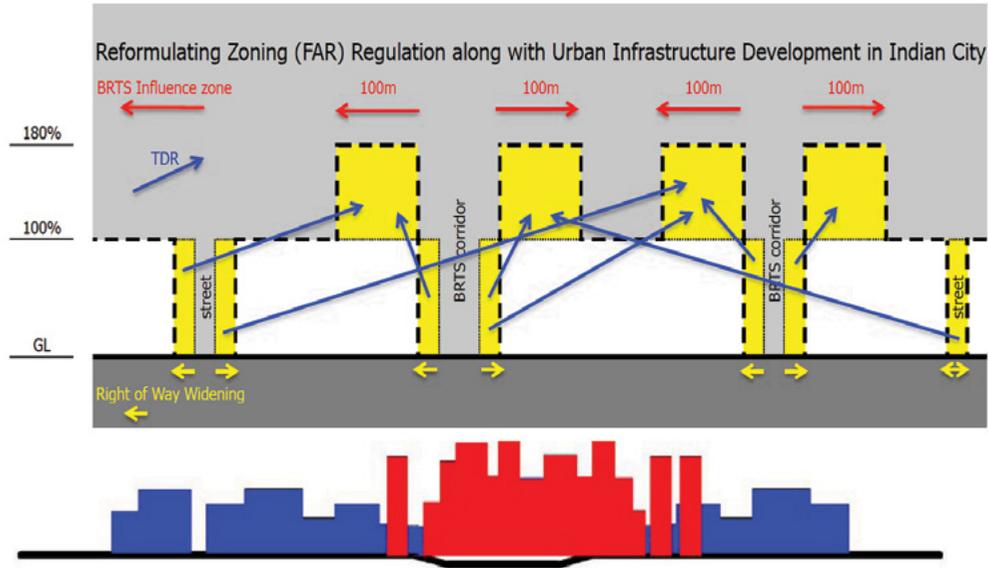


Figure 32: Strengthening the corridor densification approach for sustainability of Transit Oriented Development

to the property owners along the corridors. The development model also captures the future growth benefits such as UTF to fund the existing development activities. Other expected benefits are:

1. Improvement in travel speed
2. Reduction in accidents
3. Reduction in GHG emissions
4. Reduction in air and noise pollution
5. Reduction in energy consumption
6. Socio economic benefits

Through this development model, PCMC aims to decrease traffic congestion by encouraging existing private vehicle owners to shift towards the use of public transport and protecting natural areas by preventing sprawls and encroachment on natural areas.

Replicable Aspects of the Intervention

The project's approach is appreciable of TOD development with facilitation of infrastructure provisions and finance mechanism

to support it and boost development along with the simultaneous introduction of the BRT. The TOD Model is supporting an excellent financial strategy for the fulfillment of all the implementation aspects to achieve project success which are implementable in other cities also. Although the PCMC has created absorptive capacity for the TDRs and an incentive structure for de-congesting areas in the city while facilitating planned development in a well-defined area, the potential of the TDR mechanism to finance the first phase of the BRTS is exposed to real estate market risks and economic slowdown.

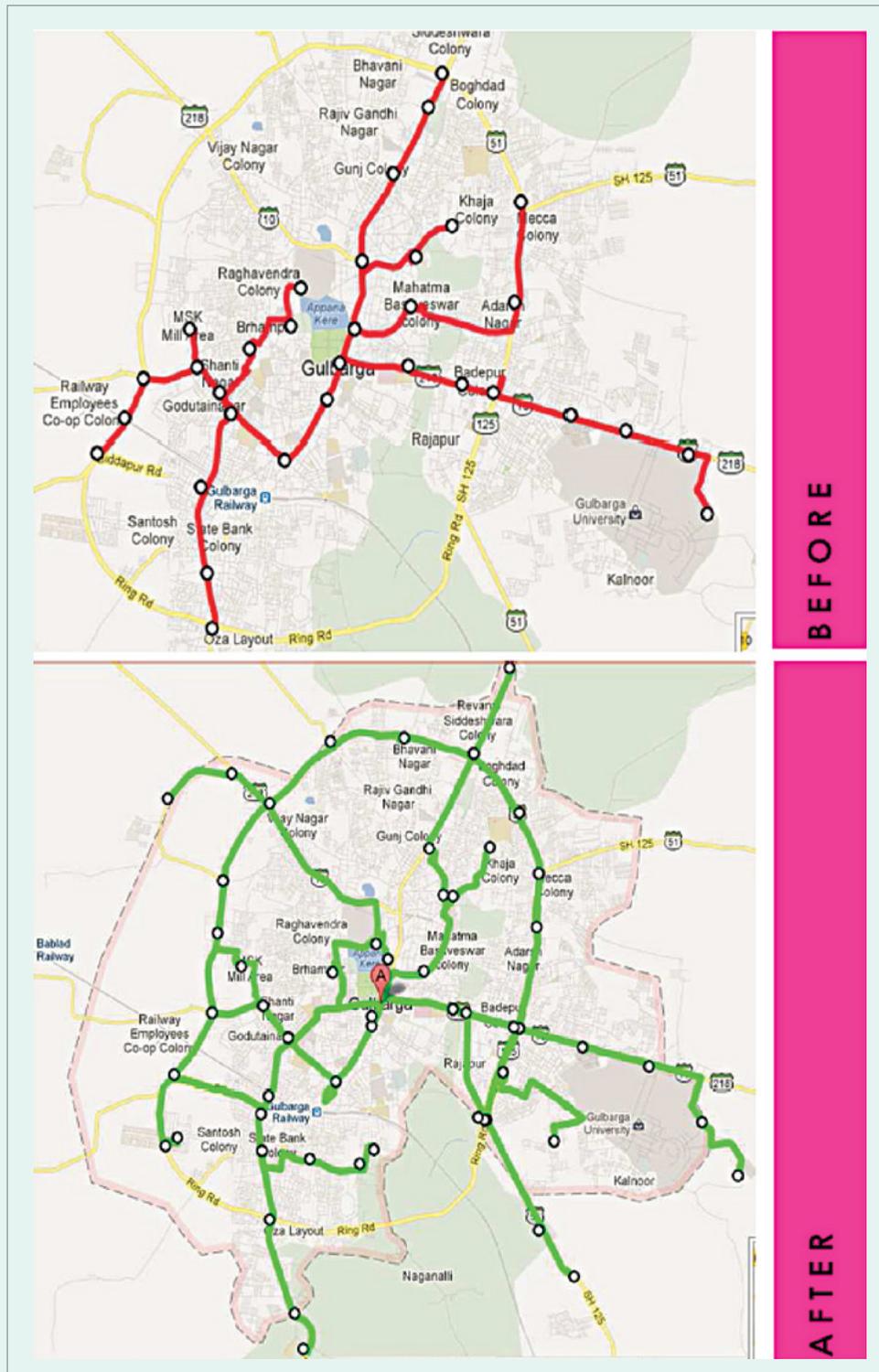
Source of Information

- <https://www.pcmcindia.gov.in>
- Resettlement Action Plan for the Proposed Bus Rapid Transit System Project in Pimpri Chinchwad, PCMC, May 2009.
- Transit Oriented Development for Pimpri Chinchwad: Workshop Outcomes and Action Plan - the Institute for Transportation and Development Policy, March 2013.

ANNEXURE

URBAN TRANSPORT SERVICES FOR MEDIUM AND SMALL SIZE CITIES, KARNATAKA

NETWORK EXPANSION- BEFORE AND AFTER IMPLEMENTATION OF CITY BUS SERVICES



AIWAR VAHINI

1. FINANCIALS OF ALWAR VAHINI SCHEME

1	2	3			4	5	6	17	8	9	10
		Price for Alwar Vahini									
Type of Passenger Vehicle	Market Price (Rs.)	For New Customer (Rs.)	For Customer with old permit (Rs.)	For Customer willing to exchange tempo for Alwar Vahini (Rs.)	Tax to State Gov. (for 5 years) Regd. Fee + Fitness Fee + Hypothecation Fee + Green Tax + Permit Fee (Rs.)	Transport Tax with Surcharge for urban route (Rs.)	Transport Tax with surcharge for rural route (Rs.)	VAT to state Govt. (Rs.)	Total estimated income to state govt. per vehicle (4+6+7) (Rs.)	Central Excise duty to Central Gov. (Rs.)	Interest Rate on Bank Finance (%)
1	Tata Ace Magic	3,59,580	3,45,580	3,14,580	5110	21,000	57,960	45,000	1,08,070	29,752	13.75
2	Mahindra Maximo	3,59,580	3,45,580	3,14,580	5110	21,000	57,960	45,000	1,08,070	29,752	13.75

11	12	13	14	15	16	17	18	19
Total Interest Payable for Loan Amount of Rs. 3 Lakh (Rs.)	Financial Burden of Interest Subsidy on State Gov. @ 10 % per vehicle (Rs.)	Net Income to State Gov. (8-12) (Rs.)	Financial Burden of Interest Subsidy on state gov. @ 2 % per vehicle (Rs.)	Net Income to state gov. (8-14) (Rs.)	Financial Burden of interest subsidy on state gov. @ 3 % per vehicle (Rs.)	Net Income to State gov. (8-16) (Rs.)	Financial Burden of interest subsidy on state gov. @ 4 % per vehicle	Net Income to State gov (8-18)
1,05,000	7,500	1,00,570	15,000	93,070	22,500	85,570	30,000	78,070
1,05,000	7,500	1,00,570	15,000	93,070	22,500	85,570	30,000	78,070

- a) For 50,000 vehicles: Total Expenditure = Approx Price of new vehicle * 50,000 = 3,45,580 * 50,000 = Rs. 1728 Crores
b) For 50,000 vehicles: Interest Burden on Gov. @ 1% subsidy = 7,500 * 50,000 = Rs. 37.50 Crores
c) Revenue generated for state gov. (Excluding central govt. revenues) = 1,00,570 * 50,000 = Rs. 503 Crores
d) Net Revenue Generated for Government = 503 - 37.5 = Rs. 465.50 Crores

FAZILKA ECOCAB

FINANCIAL BENEFIT (FIRR)

Capital Cost				
Head	Unit	Quantity	Rate	Cost
Capital Cost of one Ecocab	Nos.	100	8,500	850,000
Cost of Ecocab Registration (Two Years)	Nos.	200	50	10,000
Cost of Accidental Insurance (Two Years)	Nos.	200	30	6,000
Cost of Two Dresses for Ecocab Operators	Nos.	200	250	50,000
Educational Activities Cost	Lump sum	1	25,000	25,000
Management Cost / Registration (Two Years)	Lump sum	1	30,000	30,000
Capital Cost			971000	
Interest on Capital Cost & 4% per annum			77680	
Total Annual Capital Outlay			1048680	

Revenue				
Head	Unit	Quantity	Rate	Cost
Rental (@ Rs. 20 per day)	Per Month	100	600	60,000
Advertisement Revenue	Per Month	100	500	50,000
		Sub Total		110,000

FINANCIAL MODEL

Capital Outlay	-1048680
----------------	----------

Month of Operation	Management Cost (C.)	O & M Cost (D)	Total Per Month Expenditure (C +D)	Net Revenue
1st Month	5000	5000	10000	100,000
2nd Month	5000	5000	10000	100,000
3rd Month	5000	5000	10000	100,000
4th Month	5000	5000	10000	100,000
5th Month	5000	5000	10000	100,000
6th Month	5000	5000	10000	100,000
7th Month	5000	5000	10000	100,000
8th Month	5000	5000	10000	100,000
9th Month	5000	5000	10000	100,000
10th Month	5000	5000	10000	100,000
11th Month	5000	5000	10000	100,000
12th Month	5000	5000	10000	100,000
13th Month	5500	5500	11000	99,000
14th Month	5500	5500	11000	99,000
15th Month	5500	5500	11000	99,000
16th Month	5500	5500	11000	99,000
17th Month	5500	5500	11000	99,000
18th Month	5500	5500	11000	99,000
19th Month	5500	5500	11000	99,000
20th Month	5500	5500	11000	99,000
21st Month	5500	5500	11000	99,000
22nd Month	5500	5500	11000	99,000
23rd Month	5500	5500	11000	99,000
24th Month	5500	5500	11000	99,000
Rate of Return (FIRR)	8%			

ECONOMIC BENEFIT (EIRR)

Capital Cost				
Head	Unit	Quantity	Rate	Cost
Capital Cost of one Ecocab	Nos.	100	8,500	850,000
Cost of Ecocab Registration (Two Years)	Nos.	200	50	10,000
Cost of Accidental Insurance (Two Years)	Nos.	200	30	6,000
Cost of Two Dresses for Ecocab Operators	Nos.	200	250	50,000
Educational Activities Cost	Lumpsum	1	25,000	25,000
Management Cost / Registration (Two Years)	Lumpsum	1	30,000	30,000
Capital Cost		971000		
Interest on Capital Cost & 4% per annum		77680		
Total Annual Capital Outlay		1048680		

Revenue				
Head	Unit	Quantity	Rate	Cost
Rental (@ Rs. 20 per day)	Per Month	100	600	60,000
Advertisement Revenue	Per Month	100	500	50,000
Sub Total				110,000

ECONOMIC BENEFIT

Annual CO2 saved per Ecocab (2.07 Tones) and present cost of one Carbon Credit per annum is Rs. 900/-	Per year	414	900	372600
10.4 Trees are required to offset 2.07 tons of carbon emission				
Benefit of road safety, social impact, noise pollution	To be calculated			0
	Sub Total (Annual)	372600		
	Sub Total (per Month) (B)	31050		
	Total Revenue including Economic Benefit	141050		

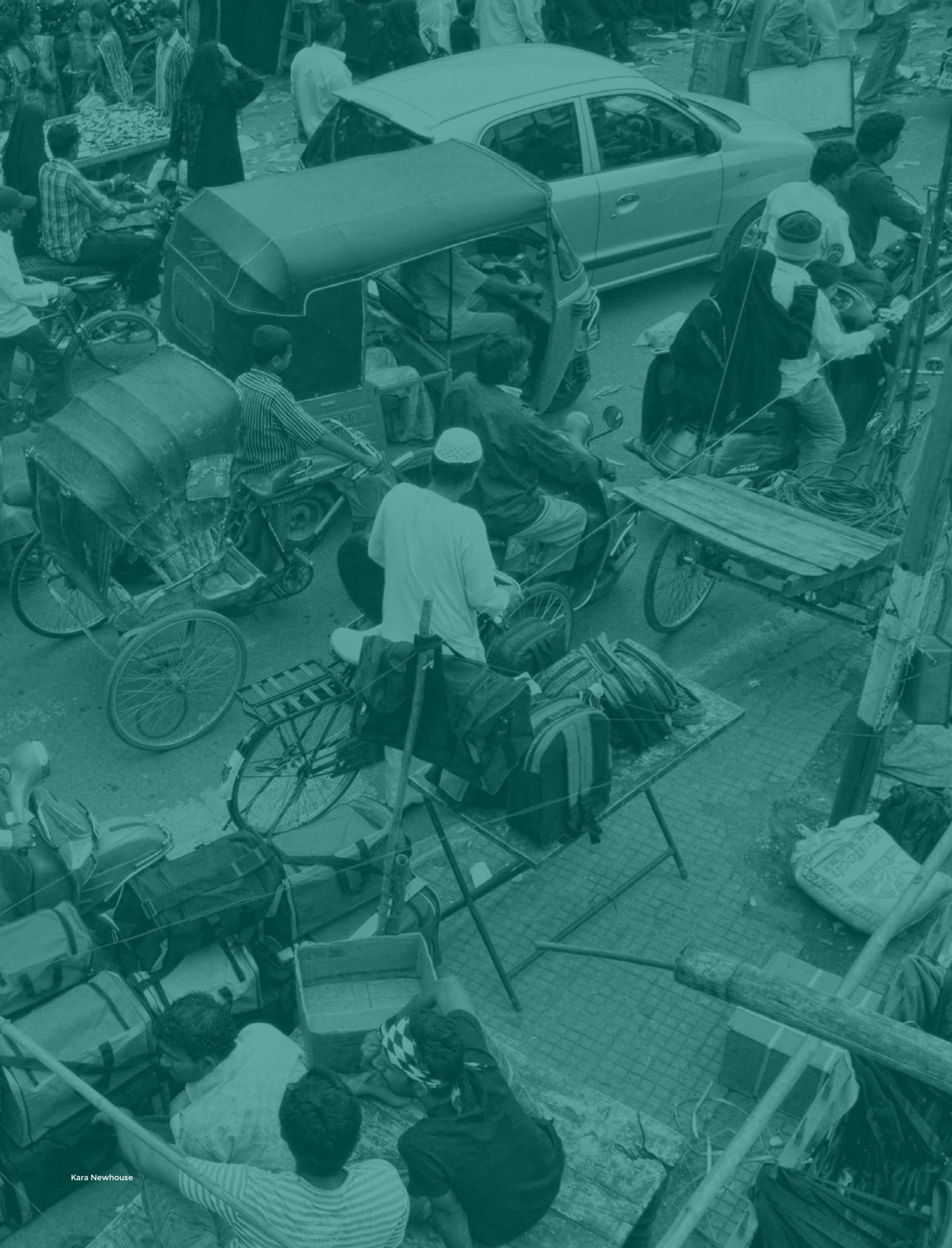
FINANCIAL MODEL

Capital Outlay	-1048680
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Month of Operation	Management Cost (C.)	O & M Cost (D)	Total Per Month Expenditure	Net Revenue
1st Month	5000	5000	10000	131050
2nd Month	5000	5000	10000	131050
3rd Month	5000	5000	10000	131050
4th Month	5000	5000	10000	131050
5th Month	5000	5000	10000	131050
6th Month	5000	5000	10000	131050
7th Month	5000	5000	10000	131050
8th Month	5000	5000	10000	131050
9th Month	5000	5000	10000	131050
10th Month	5000	5000	10000	131050
11th Month	5000	5000	10000	131050
12th Month	5000	5000	10000	131050
13th Month	5500	5500	11000	130050
14th Month	5500	5500	11000	130050
15th Month	5500	5500	11000	130050
16th Month	5500	5500	11000	130050
17th Month	5500	5500	11000	130050
18th Month	5500	5500	11000	130050
19th Month	5500	5500	11000	130050
20th Month	5500	5500	11000	130050
21st Month	5500	5500	11000	130050
22nd Month	5500	5500	11000	130050
23rd Month	5500	5500	11000	130050
24th Month	5500	5500	11000	130050
Internal Rate of Return	12%			

DETAILS FOR MEETINGS HELD

S. No.	Date	Meeting Details
1	09-Sep-13	Inception Meeting at NIUA
2	24-Sep-13	Meeting at NIUA
3	14-Nov-13	Discussion with PRG/ NIUA to finalize documentation categories
4	17-Apr-14	Finalization of Inventory List with PRG/ NIUA
5	29-Apr-14	Finalization of Documentation Format with PRG/ NIUA
6	09-May-14	Field Visit to Alwar (Alwar Vahini) Meetings held with Additional Regional Transport Officer, Alwar Vahini Operators and Passengers. IMaCS Team Members: Dr. Rajesh Chandra, Pawan Dwivedi
7	12-May-14	Field Visit to Mumbai (Mumbai Area Traffic Control Project) Meetings held with Executive Engineer, Traffic Cell (Worli) Municipal Corporation of Greater Mumbai, Traffic Police Department, API (In-charge Planning), Control Room Operators. IMaCS Team Members: Harish Kamath
8	14-May-14	Field Visit to Delhi (Aap-ki-Sadak) Meetings held with PRG Member, SG Architects IMaCS Team members: Kinshuk Pal, Pawan Dwivedi
9	19-May-14	Field Visit to Karnataka (NEKRTC) Meetings held with Divisional Transport Officer, Depot Managers and Passengers. IMaCS Team Members: Harish Kamath
10	26-May-14	Field Visit to Ahmedabad (Prahlanagar Town Planning Scheme) Meetings held with PRG Member, Deputy Commissioner Ahmedabad Municipal Corporation, Ahmedabad Urban Development Authority (DTP) IMaCS Team Members: Harish Kamath
11	16-Jun-14	Meeting at NIUA
12	25-Jul-14	Meeting with PRG and NIUA
13	22-Aug-14	Meeting with PRG
14	29-Aug-14	Meeting at NIUA





Cities Alliance
Cities Without Slums

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