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# Survey Results Report

## Regional Technical Assistance Initiative on Climate Adaptation Planning in LAC Cities

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*Final Version January 2012*

### Background

The World Bank is increasing its assistance to Governments in the Latin America and the Caribbean (LAC) region to address the growing threats of climate change and of natural disasters, and to incorporate appropriate responses in their development plans. The Bank's Urban and Disaster Risk Management Unit in the Latin American and Caribbean Region is sponsoring a regional study and technical assistance initiative concerned with climate change adaptation planning in Latin American and Caribbean cities. The main objective of this initiative is to develop a sourcebook for LAC urban decision makers based on LAC cities' experience with adaptation planning for floods and landslides. The sourcebook would fill a geographical gap by drawing from existing knowledge and tools developed for other places, adapting them as required, applying them to LAC cities and documenting the results. The sourcebook would also build practical experience with planning for changing flooding and landslide risks in LAC cities.<sup>2</sup>

The initiative includes various outputs, and includes a web-based survey tailored to city officials to assess the level of climate change adaptation awareness and planning in city governments in Latin American and the Caribbean, perceived needs, approximate levels of social and economic vulnerability to climate change impacts and the fit with existing urban development plans. This was the first time such a comprehensive survey had been carried out across the region.<sup>3</sup>

The online survey was addressed to city officials working on urban planning issues, that included disaster risk management, environmental management, and water and sanitation services provision, among others. Given that primary focus of the initiative is cities in the LAC region less likely to have had access to climate change adaptation training, finance or knowledge networks, the targeted cities were small and medium-sized (with a population range between 50,000 and 1,000,000 inhabitants). For the survey dissemination process, the project team fostered partnership with various academic institutions such as *Centro de Cambio Global-Pontificia Universidad Católica de Chile*, University of the West Indies, Federal University of Rio de Janeiro and technical agencies including ICLEI-Mexico, CEPREDENAC (*Centro de Coordinación para la Prevención de los Desastres Naturales en América Latina*) and the Global Development Learning

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<sup>1</sup> With assistance from Lorena Trejos, Tiguist Fisseha and Ellen Hamilton.

<sup>2</sup> This initiative is being funded by three interrelated grants from Cities Alliance, BNPP (the Bank Netherlands Partnership Program) and SFLAC (Spanish Fund for Latin America and the Caribbean).

<sup>3</sup> The survey template is attached in Annex A.



Network in Brazil. Also instrumental in the dissemination process was the engagement of national associations such as the Colombian Federation of Municipalities; the help provided by World Bank staff working in LAC; and a number of personal and professional contacts the team members used to reach the target audience. Most of the contacts were first established by e-mail with subsequent e-mail and telephone reminders to encourage the potential respondents to participate in the survey. Most of the contacts were first established by e-mail with subsequent e-mail and telephone reminders to encourage the potential respondents to participate in the survey.

This report summarizes the findings of the web-based survey that was conducted from July 9, 2010 through March 2, 2011. The survey was made available in Spanish, French, Portuguese and English via the online SurveyMonkey tool. The report is organized in four sections, namely background, profile of responses, main research findings, and conclusions. A list of references and relevant annexes are also included.

## 1. Profile of responses by country, geography, city size and job title of respondents (Q. Part 1: 2,4,5; Part 2: 2, 5)

The survey received responses from 226 cities and districts in 20 countries across the region<sup>4</sup>. Central America was heavily over-represented due to a large number of responses from Honduras (24% of the total). Otherwise, the responses were split mainly between the Southern Cone countries (28%), Andean countries (24%), Brazil (11%) and Mexico (5%).<sup>5</sup> Only the Caribbean region was weakly reflected in the survey (with a total of 4 cities or districts responding).

The majority of respondents reported their city as located in a mountainous zone (with Honduran respondents accounting for one-third of this total), followed by coastal and then valley regions.

**Table I: Survey Responses**

Country	Number of Cities and Districts Surveyed	Number of Submissions Retained
Argentina	20	21
Bolivia	3	8
Brazil	24	24
Chile	24	32
Colombia	14	14
Costa Rica	5	6
Ecuador	25	37
El Salvador	3	3
Grenada	1	1
Guatemala	4	5
Haiti	1	1

<sup>4</sup> Of the 316 survey responses received, 32 Respondent IDs were deleted from the pool used for our analysis. 284 responses were retained. Please see Annex B for more details.

<sup>5</sup> Southern Cone countries: Argentina, Chile, Uruguay, and Paraguay. Andean countries: Venezuela, Bolivia, Ecuador, Colombia, and Peru



Honduras	55	58
Jamaica	1	1
Mexico	11	30
Nicaragua	4	4
Paraguay	9	11
Peru	10	15
St. Vincent and the Grenadines	1	1
Uruguay	10	11
Venezuela	1	1
<b>Total</b>	<b>226</b>	<b>284</b>

No surveys were collected from the following LAC nations:

Antigua and Barbuda	Dominican Republic
Dominica	Guyana
Panama	St Kitts & Nevis
St Lucia	Suriname
Trinidad and Tobago	

Out of 177 cities that provided population estimates<sup>6</sup> 49% had a population of below 50,000 and 39% between 50,000 and 500,000. The survey therefore overwhelmingly reflects the views of policy-makers in small cities (Considering that the UN Global Urban Observatory defines *intermediate* cities to have a population range of between 500,000 and 1,000,000 inhabitants). These small cities are critically important both regionally and globally - overall they contain around half of the region's urban population (UN Habitat 2009). Policy makers in these cities may have the greatest opportunity to incorporate climate-change related considerations into their planning processes as it is in their cities that much future urban development will occur (Romero-Lankao & Dodman 2011). Cities of less than 500,000 inhabitants recorded the fastest urban growth in the region from 1990-2000 (UN Habitat 2009). Smaller cities are also likely to have lower levels of access to key public services, such as access to sanitation, which can contribute to the occurrence of disasters and heighten the health consequences of disaster impacts (Verner 2010).

Those submitting surveys who declared their job role (around half of the survey sample) consisted mainly of city decisions makers, such as mayors and council members and city planners (36%) and those playing environmental roles within government (23%). Only a very small proportion (1.8%) had a role specifically related to climate change: 3 out of the 5 respondents that did replied from the larger cities of over 1 million, indicating that these larger cities are perhaps more likely to have invested in personnel dedicated to the issue. In addition, only a small proportion (2.5%) described their job role as relating to disaster risk.

A number of additional questions in Part 2 of the survey were not fully processed due to the incomparable nature of the data submitted across the cities. However, the responses do serve to

<sup>6</sup> Of the 284 survey responses retained, 202 provided intelligible information regarding the population size in their cities (or districts). Note that when several respondents filled out the survey for the same city, not all of the responses were in agreement. After consulting independent estimates of population size, the duplicated cities were reconciled. There were a total of 177 cities surveyed that provided population estimates.



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illustrate the high level of variation in the socio-economic contexts of the cities, in terms of population density, population growth (which in some cases was negative and in others high), the proportions of population under the poverty line and living in informal settlements (which ranged greatly) and the proportion of income earmarked by central government. Some cities reported very high levels of dependence on central government transfers, which could restrict their planning autonomy (although this did not emerge as a key issue when asked about the barriers to climate change adaptation planning).

## Main Research Findings

### **2. Priority Actions of Urban Development or Sectoral Plans**

#### ***(Q. Part 1: 6)***

Question 6 of the survey asked: Please describe the priority actions of the city's urban development or sectoral plan, according to your expertise. The aim of the question was to map whether adaptation activities were being undertaken in priority sectors, but also to draw lessons for future adaptation planning exercises, which might aim to work on existing areas of priority where there would presumably be some institutional investment and momentum.

There were a number of difficulties that prevent drawing firm conclusions as the question intended, however. The open nature of the question made it difficult to discern when respondents were referring to city or sectoral plans. Some respondents read the question as referring exclusively to climate change or disaster risk management plans, with a high proportion of respondents from Honduras referring to actions in the disaster risk sector in particular. The high proportion of respondents with an environmental brief was reflected in the relatively high proportion (11% of respondents) who referred to priorities in the environmental sector. Therefore, the prominence of these sectors in the responses cannot be interpreted as a reflection of the prioritisation of these sectors in urban development plans.

What can be usefully reported is that 19% of respondents reported no plan in existence for their city or sector. However, respondents elsewhere reported that no climate change plan was in formulation or not implemented, so this high figure *may* represent a presumption that the question referred to climate change plans. Nevertheless, some of the smallest settlements (for example in Ecuador and Peru) are administered as rural districts and reported not using a territorial plan. This finding reveals a challenge to the integration of climate change considerations into existing planning exercises, especially in smaller cities.

18% of responses identified spatial planning as a priority action in their urban development plan, with this listed as a top priority in Mexico and Brazil. Many of these responses were very general in content, listing the existence of a territorial plan or the need to manage urban growth as the priority. In certain cases it included restricting and promoting alternatives to residential use for zones at high risk of climate damage.

Alongside disaster management and the environment, education and utilities were named by the highest proportion of respondents, (12% and 11% respectively). Under utilities the most commonly listed priorities related to improvements to drinking water, sanitation and waste management.



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Housing was a low overall priority (only 2%), despite being identified in Question 7 as a key sector currently impacted by climate phenomena.

Within the disaster risk sector – the sector that emerges as of key importance to the respondents of this survey in relation to climate change – the priorities listed were varied and predominantly included a range of infrastructure improvements as well as actions to resettle populations and prevent the occupation of zones affected by disasters and education and training for disaster prevention.

**Note:** The responses account for 88% of the cities surveyed. In addition, approximately 8% of respondents that answered this question reflected what he or she believed the priority actions 'should be' and not what is in fact considered in the current planning instruments, these responses were reflected in the 'unknown' category. While one would expect only one urban development plan per city, and therefore the responses might be more meaningful presented as a proportion of the cities that responded, respondents from the same cities answered the question differently (in part due to the inclusion of sector plans in the question). The responses were therefore only displayed as a proportion of respondents.

### 3. Current Impacts of Climate Phenomena (Q. Part 1: 7, 8; Part 2: 6, 7)

*“The sectors most damaged by climate phenomena in our city are the sectors of the north and south. Both sectors lack some public services...and in many cases drinking water too. In general terms the city is located in the high valley of the Rio Negro, the climate is semi-desert, precipitation doesn't go above 250mm per annum, and is very sporadic, but it can reach 50-80mm in a day. This situation, added to the lack of services, causes emergencies [floods], and evacuations in certain places of the city” – Civil servant, General Roca, Argentina*

*“Floods affect an important number of the low-income population, who need to be evacuated to temporary housing because their houses are affected. There are great losses to their belongings. They are also increasingly exposed to water-borne diseases.” – Civil servant, Artigas, Uruguay*

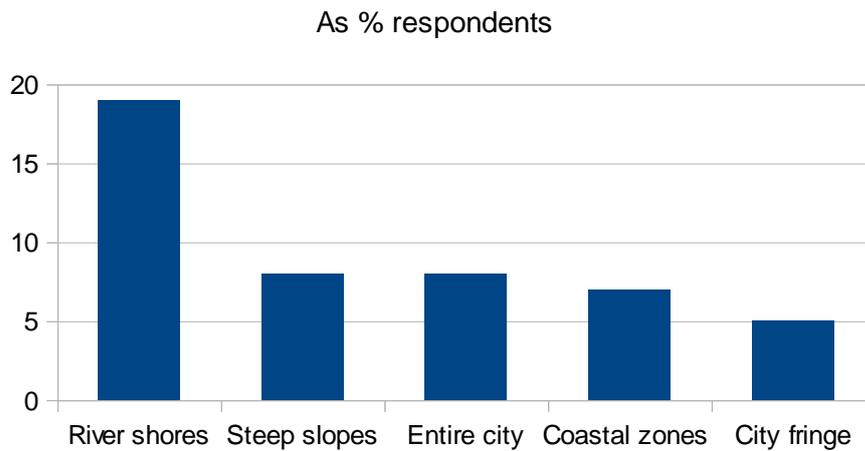
Asked in Part 2 what climate phenomenon affects their cities, a high proportion reported vulnerability to the impacts of climate phenomena. The strongest response was flooding (50% of respondents and 56% of cities), followed by drought (31% of respondents and 38% of cities), storms (16%) and hurricanes (11%). Landslides were listed as a climate phenomena affecting the cities for 13% of respondents (16% of cities).

Question 7 of the survey asked: Please describe what, if any, sectors and/or populations of the city are currently impacted by climate phenomena. The majority of respondents described the most vulnerable sectors of the city population, most often poor / low-income, or named as 'marginal', or living in 'irregular' settlements on the city peripheries. These populations were also most often referred to in relation to their living in areas lacking in infrastructure or in low-lying areas, next to water courses or others considered to be at high risk from floods or other climate events.



In addition, over 18% of respondents, and 21% of cities, stated that river shores were impacted by climate phenomena. While only 6% of respondents reported their city to be in the geographic location of river shore, the number reporting impacts to their river shores reflects the strong response related to the impacts of floods (see below). For those respondents answering according to geographic area steep slopes (mainly those respondents from the Andean region), the entire city and coastal zones were the most common answers.

**Graph 1a: Geographic zones of the city currently impacted by climate phenomena**

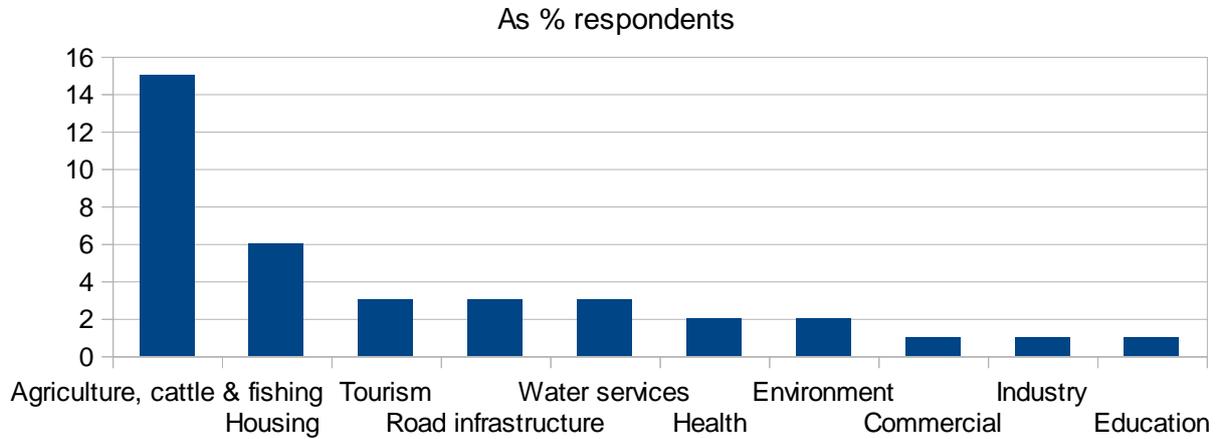


Of those answering according to socioeconomic sector (Graph 1b), 15% identified agriculture, cattle farming or fishing. In part this was a reflection of the way respondents answered the question, with some answering the question as a general one, rather than one related specifically to their city. Some, however, referred to the rural districts of their cities. In addition, the response could reflect perceptions of the direct impacts that climate-related phenomena have in these sectors, and perhaps indicates a lack of awareness of the multiple direct and indirect impacts on other sectors in urban areas. However, given that the responses were predominantly from the smaller sized cities, the response also indicates the greater proximity and importance of the agriculture sector to these cities. When asked about the key economic activities in the city in Part 2 of the survey agriculture, cattle farming and fishing featured heavily: in 59% of cities agriculture was reported as a key economic sector.

6% named the housing sector, often identifying housing with urban impact and agriculture with rural impact. The impacts on tourism, commerce and industry were only mentioned by a small proportion of respondents, despite also being listed as key economic activities in the cities (by 21-31% of respondents respectively), and the impact on services was not mentioned despite 23% of respondents naming it as a key economic sector in their city.



**Graph 1b: Socioeconomic sectors currently impacted by climate phenomena**



When asked *how* these areas or sectors were affected by climate phenomena (Q.8), the majority of respondents pointed back to the climate phenomena: the impacts of floods (33.5% or 40% of cities) and landslides (16.2% or 21% of cities), and this emphasis is strong across all respondents regardless of geographic location, area or city size<sup>7</sup>. Other disaster-related impacts – forest fires and droughts - were also listed by 4.2% and 2.5% of respondents.

In line with the responses to Question 7, a significant proportion of respondents also pointed to losses in the housing sector under Q.8 – both the direct loss of homes and property (10.6%), housing damage (7.7%) and housing devaluation (1.1%). A large group of respondents then identified human impacts in their cities: the loss of human life (11.3%), increase in human disease (2.1%) and accidents (1.1%). Loss of crops and cattle – in line with the emphasis on agriculture in Question 7 – was identified as an impact by 13% of respondents, often in relation to drought impacts. The other significant group of impacts listed relate to disruption to infrastructure: roads (6%) and traffic (0.7%), water supply (5.3%), power cuts (0.7%), health centres (0.4%) and infrastructure collapse in general (2.8%). Other impacts mentioned included physical isolation, water scarcity, loss of livelihoods, alteration of soil, reduction in fish, children missing school, discouragement of investment, reduction of beach areas, loss of species, food scarcity, fear, and the reduction of tourism. A civil servant from Beni, Bolivia, commented:

*“The whole population is affected somehow, with impacts not only economic but psychological, due to the fear of lack of water”.*

<sup>7</sup> With the exception of Brazil, where loss of crops and cattle was the most often cited impact.



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## 4. Institutional responses to climate impacts (Q. Part 1: 9-11)

A set of 3 questions sought to address the ways in which city institutions were currently responding to climate-related and climate change related impacts: one which referred to existing actions in response to climate phenomena, one which referred to changes in programs in response to a changing climate and a final question focused specifically on adaptation activities.

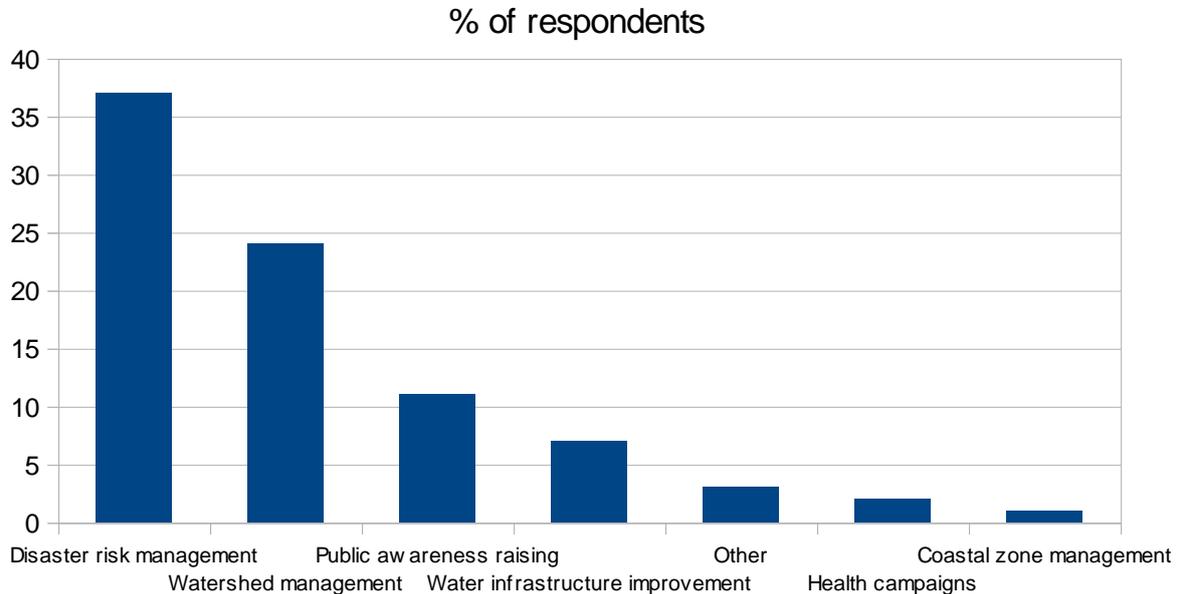
### a. Existing measures to address climate impacts

Question 9 of the survey asked: Please describe any existing programs/projects you are aware of that address the impacts of climate phenomena on the city. Nearly 80% of respondents answered this question, accounting for 94% of the cities surveyed. However, 10% of respondents cited programs/projects for climate change mitigation rather than programs/projects that address the impacts of climate change, potentially reflecting both a confusion in terminology by the respondents, and a tendency to misread the question, which referred to existing climate phenomena, and was not intended as a question related to future, man-made and often separately funded *climate change* programs. Instead, the question aimed to elicit responses about programs that might either constitute an adaptation to climate change in practice (but not have been labeled as such) or form the possible bedrock for future adaptation programs. However, owing to possible confusion, climate-related programs not badged as climate change programs may have gone unreported.

Of the results available, 37% of respondents identified disaster risk management programs. This was a strong response across regions, geographic locations and city sizes. Within this response, the largest proportion of respondents referred to flood management programs to re-route rivers (11%), followed by a conventional set of disaster risk management activities: risk mapping (5%), the formulation of risk management plans (5%) and relocation of high-risk settlements (5%), early warning (4%) and implementation of stations and information systems (4%). Only a very small proportion of respondents referred to measures related to the reduction of vulnerability to climate-related events and all were in reference to the housing sector: 1% to building safer houses, 1% to slum upgrading and 1% to the control of slum building. After disaster risk management, respondents then identified watershed management (24%), public awareness campaigns (11%) and water infrastructure (7%) (see below). Water infrastructure specifically related to storm water system installation.



**Graph 2: Programs or projects addressing existing climate impacts**



Coded under the 'Disaster risk management' category, 3% referred to the formulation or implementation of national adaptation plans and 3% to the creation of a climate change or risk management unit. While the true number may be higher owing to those responding in accordance with the more restricted meaning of the question, the cities that reported the creation of a climate change or risk management unit in their city were: Maipu (Argentina), Minas (Uruguay), Siuna (Nicaragua), Intibuca la Esperanza, Corquin, Proterillos Cortes, Municipio la Lima Cortes (Honduras), Tatui / Sao Paolo (Brazil) and Tabarre (Haiti).

**b. Changes to programs in light of climate impacts**

Question 10 of the survey asked: Please describe any changes that have been made to existing programs in light of the impacts of climate phenomena in the city that you are aware of. For this question there were low response levels relative to other questions (only 60% of respondents answered this question, accounting for 73% of the cities surveyed) indicating that, despite the existence of programs to mitigate climate-related impacts, cities are not necessarily making changes to these programs in response to climatic change (i.e. adapting, even outside the framework of formal climate change adaptation plans and programs).

Most changes were reported in the environmental sector (14%) (although again this could reflect the environmental bias of the participants, who would have the best in-depth knowledge of these programs). The largest category from these responses referred to watershed management actions (predominantly through reforestation programs and the protection of water basins), although respondents also referred to water management and conservation areas being made a priority, the implementation of an environmental development plan, increased programs related to energy and water efficiency, community-based algae management in coastal areas and more environmental education programs.



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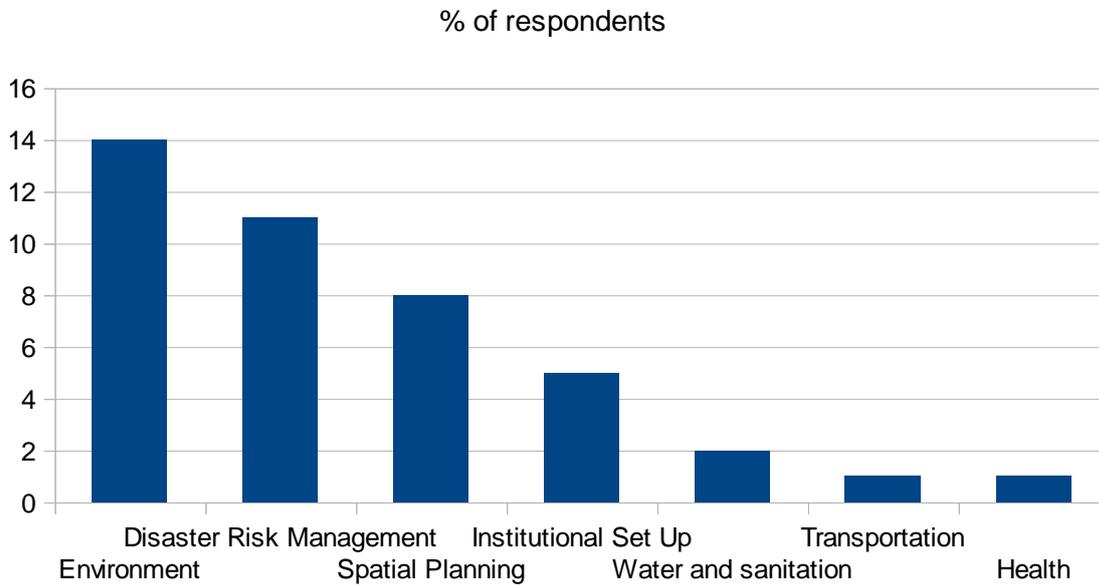
**Table 2: Changes that Have Been Made to Existing Programs in Light of the Impacts of Climate Phenomena in the City, Breakdown of 'Environment' Category**

Percentage of Respondents	Environment Program
6%	Water shed management (including reforestation)
2%	Setting of natural areas conservation as a priority
2%	More environmental education programs implemented
1%	Setting of water management as a priority in the government's agenda
1%	Environment development plan implementation
1%	Increased coverage of programs concerning energy efficient use
1%	New regulations related to gas emissions by industry
<1%	Increased coverage of programs concerning water efficient use
<1%	Coordinated work with locals to control algae population in coastal areas

The second largest set of responses after environment related to disaster management (11%) and included a number of measures to increase the priority and efficacy of the sector: an increased interest in risk management, the allocation of more money to the sector, the updating of guidelines and plans, new infrastructure and technologies, the involvement of civil society, settlement relocation and the implementation of an early warning system. 8% reported modifications to spatial planning (improvements in land use regulation, modification of building codes, reclassification of land use zones and the consideration of climate change in urban plans). 5% reported changes to institutions to consolidate disaster risk management and create entities responsible for environmental and disaster risk management.



**Graph 3: Sectors where changes were reported in light of climate impacts**



Under this question, a number of cities reported the consideration of climate change in urban development plans, these were: Montevideo (Uruguay); San José de Mayo (Uruguay); Linares (Chile); Tijuana (Mexico); Sucre (Ecuador) and the cities of Canelones (Uruguay)<sup>8</sup>. Quito (Ecuador), Bogota (Colombia), Tatui / Sao Paolo, Brotas / Sao Paolo and Itapuranga – GO (Brazil) also reported the introduction of climate-change related variables in their water and sewerage system master plans.

### c. Climate adaptation programs

Question 11 of the survey asked: Please describe any strategies, programs or studies that have been undertaken or are under development in your city specifically to promote adaptation to the impacts of climate change i.e. long-term adjustments to the impacts or likely impacts of climate events attributable to anthropogenic climate change. Although 87% of cities surveyed were represented in the answers provided, only 70% of respondents answered this question. The fact that 18% reported the implementation of Clean Development Mechanisms, and in addition responses included the introduction of energy efficiency measures and traffic reduction measures, confirms earlier confusion by respondents in distinguishing between adaptation and mitigation

<sup>8</sup> To give some examples, in the case of San José de Mayo, the department is working with the Territorial Approach to Climate Change project (UNDP), which promotes mitigation and adaptation strategies through seminars and workshops. In the case of Canelones, Uruguay, the department shares a climate resilience program designed by the metropolitan area; this program integrates mitigation and adaptation strategies into sectoral planning on topics such as waste management, coastal management and risk management. For more details see analysis undertaken for this project for the Southern Cone countries (*Centro de Cambio Global-Pontificia Universidad Católica de Chile*, a member of the Advisory Committee of the initiative) and a literature review of existing planning initiatives (Fraser, A. Climate Change Impacts on Cities in Latin America and the Caribbean).

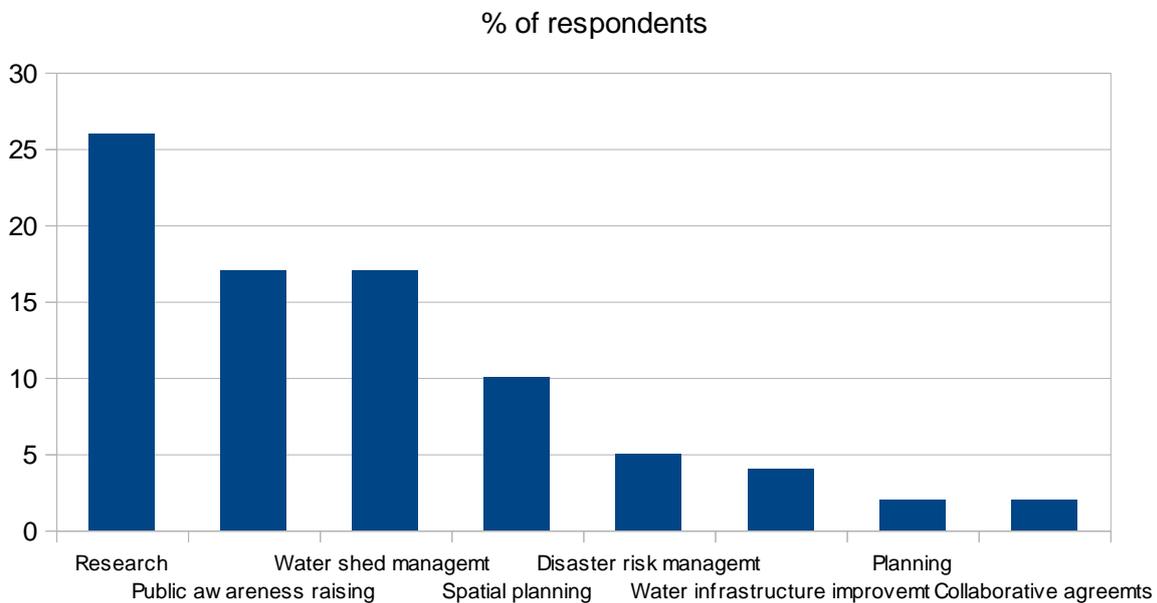


actions.

Nevertheless, of those actions relating to adaptation, the largest category relates to research activities on climate change scenarios, impacts and vulnerabilities (nearly 26% of respondents). 17% of respondents reiterated the use of watershed management programs, public awareness raising (17%) and spatial planning (10%) for adaptation (Graph 4). Under planning instruments, only 2% pointed out the development of specific adaptation plans, which included national as well as local plans. The cities of Rosario (Argentina), Tijuana (Mexico), Quito (Ecuador) and Bogota (Colombia) and the department of Canelones (Uruguay) reported local adaptation plans or strategies. One environment department employee in Tijuana, Mexico, commented on the relationship between national and local level climate change planning processes: *“At the state level, they are working on the development of a climate change agenda using scenario models and temperature change projections, but although they are disaggregating the analysis by region and municipality there is a lack of evaluation of real local capacities...to establish levels of vulnerability and specific needs.”*

Only in Mexico was a strong link made between disaster risk reduction activities and the promotion of adaptation, with 17% of Mexican respondents describing disaster risk management programs as linked to adaptation measures.

**Graph 4: Types of adaptation activity reported**



## 5. Adaptive capacity of city governments (Q. Part 1: 12-14)

The next set of questions aimed to gauge aspects of the adaptive capacity (and potential) of the cities responding to the survey: the training of city officials, their commitment to the issue and the barriers to working on it.

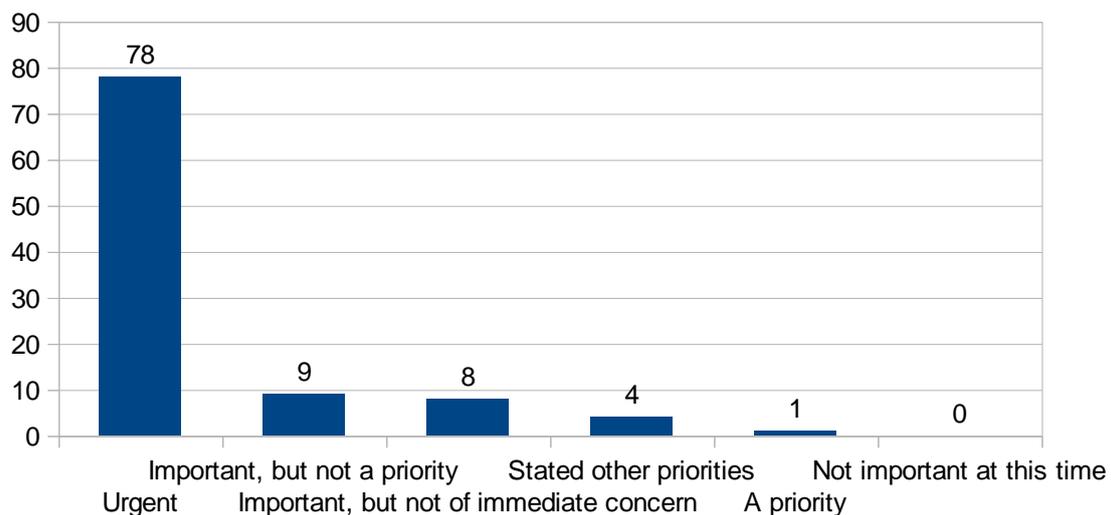


Participants were asked what training or meetings officials in their city had been involved in relating to climate change impacts and adaptation if any. 71% respondents replied in the affirmative (representing 88% of cities), both as receiving and providing training and meetings. However, the confusion with mitigation actions continued with a small proportion of respondents reporting activities in relation to mitigation or the clean development mechanism. 17% reported some training related to climate change impacts, and 3% climate science or variability. Only 3% reported training explicitly related to climate change adaptation (respondents in Leon (Guanajuato Mexico), San José de Mayo and Canelones (Uruguay), Concepcion (Chile), Santa Rosa de Cabal, Risaralda (Colombia), Buenos Aires (Argentina) and Chetumal Othon P Blanco (Mexico). 15% reported training related to sustainable development and 11% related to risk management. 8% reported attending relevant meetings, including international meetings such as the ICLEI World Mayors Summit and COP15.

In answer to the question whether the adoption of policy measures to adapt to climate change were viewed as urgent and important, there was a strong response: 78% of those who responded to the question (93% of all respondents) stated that the adoption of such measures was urgent. The lowest level of responses to this effect came from the Southern Cone, where 21% believed climate change adaptation was important but not a priority, and Brazil, where 25% of respondents also expressed the view that the issue was important but not a priority.

### Graph 5: Ranking of importance of adaptation policy measures

% of respondents answering Q.13



Finally, when asked about the barriers to working on climate change adaptation in their cities (Graph 6), 30% identified finance as a factor (although this was much less prominent in the responses from Brazil), including both central government and international finance.

20% also listed awareness and 20% (reliable) information and knowledge. In the words of one official from Uruguay: *“There are still many people who believe that climate change is a ‘snobs’*

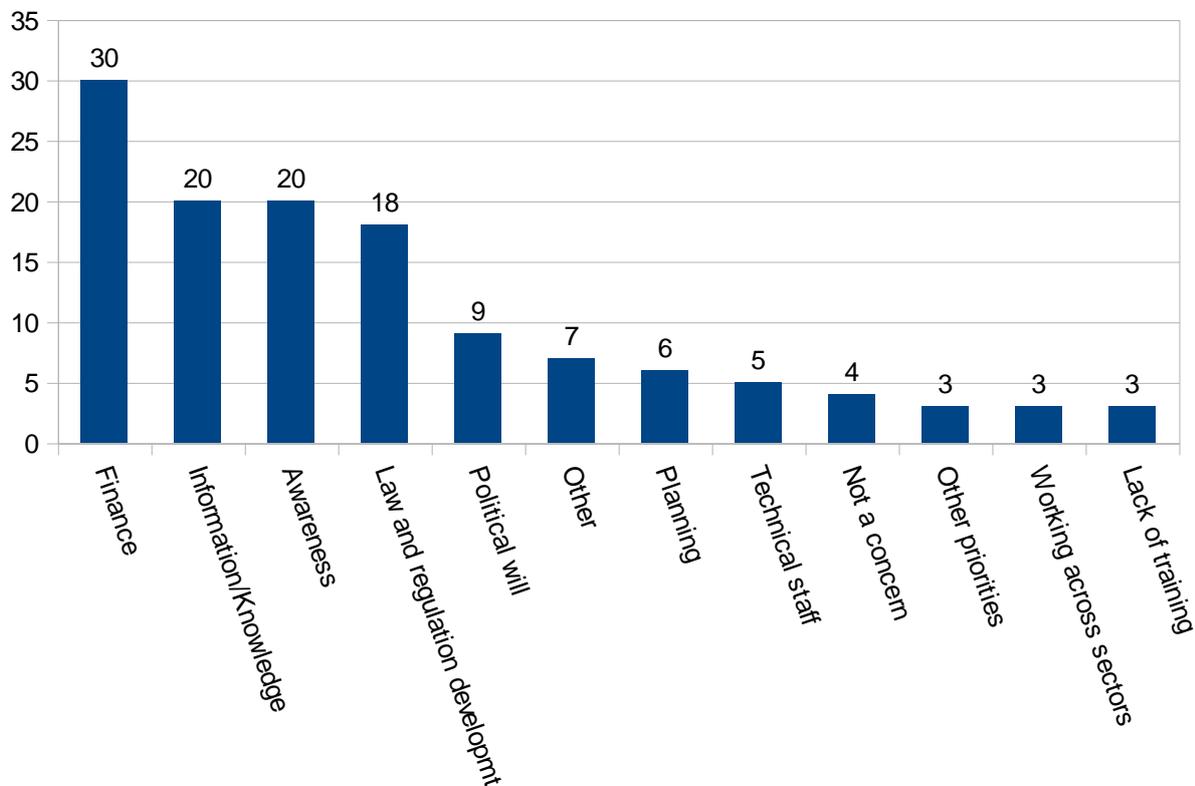


theme, they don't feel directly affected and there is a lack of awareness by some political actors". In the same vein, a disaster risk manager in Colombia commented "It's not seen by decision makers as an important theme in local development politics, and neither do communities perceive climate change as something that affects their quality of life".

18% pointed also to the lack of policies, regulations and controls necessary. Other factors listed (in order of preference by the respondents) included lack of political will, problems with planning (short-termism, over-centralization, infeasibility and lack of concrete programs), lack of technical staff, the fact that climate change is not a vote-winning issue (especially given that the majority of the cities reported having elected mayors or governing councils), other priorities and barriers to inter-institutional and inter-sectoral work, and lack of training.

Planning issues were cited most commonly in Mexico, lack of policies etc. most commonly in Brazil, and lack of information and knowledge most often in the Andean region.

Graph 6: Barriers to working on climate change adaptation



**Note:** Nearly 87% of cities surveyed were represented in the answers to this question, which were collected from 80% of survey respondents.



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## Conclusions

### 1. Climate impacts and the response of city governments

The survey results confirm that city officials across geographic zones are witnessing the vulnerability of the region's cities to the physical impacts of climate phenomena, most prominently those related to extreme events (floods, storms, landslides and hurricanes) and drought. The survey did not reveal a strong awareness by officials, however, of the multiple, long-term and less visible impacts that climate change phenomena could have across a range of sectors. One caveat to this might be the awareness that policy-makers in the environmental sector exhibited about the linkages between ecosystems and cities, and the importance of watershed management and other conservation efforts to the protection of the city against climate-change related risks.

City decision-makers and administrators are also highly aware of the differential impact climate events have across city populations, highlighting that the issue disproportionately affects the poorest and most marginalized population groups who live with the least access to services and infrastructure and are most impacted by disaster-related events. Although the survey did not probe in depth the way these social vulnerability issues are being addressed through adaptation and adaptation-related activities, findings from other studies indicate that cities in the region are rarely taking an explicitly pro-poor or vulnerability-based approach to the issue (Hardoy & Lankao 2011). There is some evidence for this here. On the positive side, under 'types of adaptation activity', some cities did list undertaking vulnerability studies. However, few concrete adaptation activities were reported that were directly linked to poverty alleviation issues. In the disaster risk management sector too, sectoral priorities did not include the reduction of social vulnerability per se, while the most common measure cited to address climate-related impacts was infrastructure improvements to mitigate flooding, followed by mapping, planning, relocation, early warning and information activities.

A less expected finding in the urban context was the identification of agriculture, cattle rearing and fishing as sectors impacted by climate phenomena and as key economic activities for the cities. While this finding should not be over-stated for the reasons outlined in the section above, it does suggest the need to pay attention to the particular economic dynamics of small cities, and the linkages between cities and their rural hinterlands.

Finally, despite the relative emphasis on losses experienced in the housing sector as a result of extreme events, housing issues such as building improvement appeared low on priorities in both overall city plans and in disaster management plans (with resettlement policies a more common policy option in the sector). Given the losses in the sector, this could be an area for greater attention by policy-makers.

### 2. Institutional response and preparedness for climate change adaptation

How well equipped institutionally are Latin American and Caribbean cities to tackle the impacts of climate change? The study confirmed a strong commitment from municipal policy-makers to the issue of adaptation, with the vast majority viewing adaptation policy measures as urgent.

Only a small proportion of the respondents pointed to formal adaptation planning exercises taking



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place in their cities, in particular larger cities, often but not exclusively from Mexico or the Southern Cone countries. Nevertheless, this still amounts to numerous cities whose experiences could be usefully disseminated to their regional counterparts and has not been well documented. A much higher proportion reported engaging in the initial steps of adaptation planning, however, through research on scenarios, impacts and vulnerabilities.

Overall, there did not appear to be a high technical awareness of adaptation issues among the 284 respondents of this survey, with a strong tendency to mix adaptation and mitigation concerns. Although a majority had received and provided climate change training and meetings, very few were concerned directly with adaptation, although a higher number were concerned with climate change impacts and climate change in the context of the broader concerns of sustainable development and risk management. When asked about the barriers to future planning, therefore, there was a strong response related to information and knowledge. Studies undertaken elsewhere, however, caution against responding to this perceived need by simply providing more scientific information, which policy-makers can find hard to make relevant and integrate (e.g. ACCRN 2009, Fünfgeld 2010).

Finance was cited most often as the barrier to adaptation planning, a finding consistent with a recent ICLEI global survey of adaptation planning in cities (ICLEI 2011). Respondents also highlighted awareness (of both political actors and the general population) as well as law and regulation development as key barriers, issues difficult to tackle through stand-alone, technical adaptation projects and which may require work with political actors at other levels of government. The responses also indicate the need to tailor the focus of adaptation interventions according to the context. Respondents in the Southern Cone and Brazil were more likely to stress that adaptation was important, but not a priority. In addition, Brazilian respondents were less likely to list finance as a constraining factor, instead emphasizing the lack of policies, regulations and controls while in Mexico planning issues dominated the responses.

In addition, although not cited as a 'barrier' to adaptation activities by respondents, an issue that emerges – again as a feature of smaller cities – is the lack of territorial plans specific to the urban area. The process of adaptation planning in these urban areas, therefore, needs to take this into account.

### **3. Entry points for adaptation planning**

A further area for discussion that emerges from the study is the choice of entry point for adaptation planners working in the regions' cities. Given the high awareness of disaster-related impacts in the cities and the identification of disaster risk management policies as key to tackling existing climate phenomena this appears to be the sector where there might be most immediate purchase on climate change issues. The answers to question 10 (please describe changes that have been made to existing programs in light of the impacts of climate phenomena) also indicate a certain growth and dynamism in the sector across the region's cities (although this is by no means uniform, and one respondent from Bolivia reported that apart from measures in place in the department of Trinidad and to some extent La Paz, there is no system of disaster management in operation across municipal districts). No strong link was made by respondents between adaptation activities and disaster risk management activities (except in Mexico), however – indicating that



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adaptation concerns have yet to be introduced into the sector. Identifying what the introduction of adaptation concerns will mean for the disaster risk sector will be an important next step. As Solecki et al. (among others) highlight, disaster risk management policies will need to acknowledge the changing parameters of climate of both greater stretches of territory and time, in a way which requires ongoing reassessment (Solecki, Leichenko & O'Brien, 2011).

The emphasis on disaster risk should also not obscure other signals from this survey about potentially productive synergies between existing policies and adaptation planning. Spatial planning issues were a key priority in urban development plans, and already linked to adaptation activities in many cases through zoning and restricting development in disaster-prone zones. There is more to this issue that could be developed, given the concern by respondents with managing city growth and only nascent understanding about the linkages between urban growth and density patterns and climate change vulnerabilities (for more on this issue, see for example, Fünfgeld 2010). The fact that a large proportion of the survey respondents were from the environment sector may also indicate how far climate change is seen by policy-makers as an environmental issue. This group of people obviously, therefore, have a key role to play in moving adaptation agendas in cities forwards and the activities they identified as key to responding to climate change impacts, in particular watershed conservation and water management, will be a key plank of the adaptation agenda.

## Acknowledgments

This scoping exercise was possible thanks to BNPP (the Bank Netherlands Partnership Program), SFLAC (Spanish Fund for Latin America and the Caribbean) and the Cities Alliance Trust Funds. We would also like to acknowledge the contribution of the over 300 city officials across LAC who participated in the survey and the network of academic institutions, technical agencies, national associations, World Bank staff and other personal and professional contacts that helped the team in the dissemination process.

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## Annex A: Survey Template

Below is the survey that was available online for respondents in English. Note that the survey was also conducted in Spanish, French and Portuguese.

Dear Sir/Madam,

Thank you for taking part in this survey for the World Bank's regional Urban, Water and Disaster Risk Management unit for Latin America and the Caribbean.

The aim of the survey is to solicit the opinions of city officials ahead of a planned World Bank project to assist city governments in the region to better understand and plan for the consequences of climate change.

The survey is in two sections. The first section asks for your knowledge and views. We anticipate that this section will take at most 30 minutes to complete. The information you provide will remain anonymous.

The second section asks for data about your city. If you are completing this survey as a team, or in conjunction with other colleagues, you may provide just one set of this data.

### SECTION ONE

1. Name
2. Job Title and Institution/Organization
3. City Name
4. E-mail
5. Country
6. Please describe the priority actions of the city's urban development or sectoral plan, according to your expertise.
7. Please describe what, if any, sectors and / or populations of the city are currently impacted by climate phenomena.
8. Please describe how they are impacted.
9. Please describe any existing programs/projects you are aware of that address the impacts of climate phenomena on the city.
10. Please describe any changes that have been made to existing programs in light of the impacts of climate phenomena in the city that you are aware of.
11. Please describe any strategies, programs or studies that have been undertaken or are under development in your city specifically to promote adaptation to the impacts of climate change i.e. long-term adjustments to the impacts or likely impacts of climate events attributable to anthropogenic climate change.



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12. Please describe any training or meetings city officials have been involved in relevant to the impacts of and adapting to climate change, according to your knowledge.

13. Do you consider the adoption of policy measures to adapt to the impacts of climate change, potentially as part of your city's urban development or relevant sectoral plans, to be:

Urgent

Important, but not of immediate concern

Important, but other urban development issues should take priority

Not important at this time

Other (please state)

14. What, if any, do you perceive as the main barriers to further work on climate change adaptation in the city?

## SECTION TWO

Please provide the following information, where known.

A colleague of mine will be completing this data for our city.

Yes  No, (the information is below)

1. Population size of city (if known, year)
2. Population density of city (if known, year)
3. Current rate of population growth of city
4. Geographic location of the city (e.g. coastal, delta, mountainous)
5. Climate phenomena that affect the city (e.g. drought, hurricanes, floods)
6. Key economic activities of the city (e.g. tourism, fishing)
7. Proportion of the city population living under the national poverty line
8. Proportion of the city population living in informal settlements
9. Brief description of city government structure (e.g. elected or appointed mayor; elected or appointed city council)
10. Proportion of city revenues designated by national government allocations

## END OF SURVEY

Thank you for your time. Please let us know below how you heard about the survey.

How did you hear about the survey?



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## Annex B: Editing Survey Responses

Of the 316 survey responses received, 32 Respondent IDs were deleted from the pool used for our analysis for one of the following reasons:

- No city name was included in the response
- The response only addressed questions related to the identity of the person or city surveyed
- Little relevant information was provided in the response
- The submission was an exact duplicate of another Respondent ID
- Information was merged with another respondent ID to form one complete submission<sup>9</sup>

Some of the responses were modified in order to facilitate analysis:

- Two submissions, for Maipú and Zamora, had county listed in the field instead of country
- Some respondents were representative of one or more districts rather than cities: La Paz-Santa Cruz-Beni, Intibuca
- City and country entries were altered to be uniform throughout the spreadsheet (such as the removal of accent marks, abbreviation, spacing between words).

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<sup>9</sup> For example, Eleniza Castro de Oliveira submitted 3 responses: the first only provided identification information, the second provided responses for the first part of the survey, and the third answered the second part of the survey. Since pivot tables were used to analyze the data, one of Eleniza's respondent id's was retained and the information of the other two responses were hardcoded into the retained entry.



## Annex C: Survey Data Coding

Below is a table with the survey questions as well as the categories used to group the online survey responses. Pivot tables were then used to analyze the data collected.

Question	Data Grouping	Description/Additional Detail	Detail Not Analyzed in Pivot Tables
<b>SECTION 1</b>			
1. Name			
2. Job Title	1=Environment	Renewable energy, forestry	
	2=Utilities	Water, energy and other utilities	
	3=Decision Making	Mayor, City Councilor, Planners	
	4=Health	Including hygiene	
	5=Housing		
	6=Tourism		
	7=Disaster Risk Management		
	8=Other	Media, academia, research, among others	
	9=Non-governmental	Communitarian organization, private business	
	10=Specific climate change-related role		
	11=Job includes climate change-related component		
3. E-mail address			
4. City name			
5. Country			
6. Priority actions of the city's urban development or sectoral plan  <b>Notes:</b> -Some answers reflect what the respondent believes the priority actions 'should be' and not what is in fact considered in the planning instruments above mentioned.	1 = Transportation		1a = Public transportation improvement, 1b = sustainable mobility, 1c = road infrastructure
	2 = Spatial planning		2a = Urban renewal, 2b = cultural heritage preservation, 2c = urban densification, 2d = land tenure regularization, 2e = metropolitan integration 2f = urban layout 2g=land use plan formulation
	3 = Water, energy and other utilities		3a = Water supply and sanitation services provision, 3b = storm water management 3c = solid waste management (including hazardous ones) 3d = energy supply 3e = natural gas supply
	4 = Housing		4a = house improvement
	5 = Disaster risk management		5a = Early warning, 5b = relocation of high risk-prone settlements, 5c = risk mapping, 5d = flood management (eg. River



Question	Data Grouping	Description/Additional Detail	Detail Not Analyzed in Pivot Tables
			rerouting) 5e=creation of disaster risk management unit (e.g CODEM – Municipal Emergencies Committee and CODEL- Local Emergencies Committee) 5f=formulation of disaster risk management policy 5g=training on risk management 5h=risk monitoring
	6 = Environment		6a = Water resources management, 6b = watershed management (e.g. land acquisition, reforestation), 6c = energy saving, 6d = atmospheric pollution control, 6e = payment for environmental services, 6f = environmental education 6g = protection of ecological areas 6h=environmental policy formulation 6i=coastal environment improvement
	7 = Tourism		
	8 = Industry		8a = Industry modernization
	9 = Education		9a = Construction of education facilities
	10 = No Plan		
	11 = Other		11a = Food security, 11b = poverty eradication, 11c = citizens' participation, 11d = urban security, 11e = sports promotion, 11f = urban amenities (e.g. market places, open space increment) 11g = institutional strengthening 11h=arts and culture promotion 11i=vulnerable groups 11j=employment generation
	12 = Health		
	99 = Not known/Not answered		
	100=Unclear		
7. Sectors and/or populations of the city that are currently impacted by climate phenomena	<b>By sector:</b>		
	7.1=Fishing		
	7.2=Tourism		
	7.3=Agriculture		
	7.4=Cattle farming		
	7.5=Health		
	7.6=Environment	Biodiversity, ecosystems, forests	
	7.7=Commercial		
	7.8=Road infrastructure		



Question	Data Grouping	Description/Additional Detail	Detail Not Analyzed in Pivot Tables
	7.9=Housing		
	7.10=Industry		
	7.11=Education		
	7.12=Water services		
	7.13=Energy supply		
	<b>By Location:</b>		
	7a=River shores		
	7b=Steep slopes		
	7c=Coastal zones		
	7d=Entire city		
	7e=Oldest areas		
	7f=City fringe		
	7g=Other	Poorest segments of the population; most vulnerable groups (women and children); everybody	
99 = Not known/Not answered			
100=Unclear			
8. How sectors and/or populations of the city are affected by climate phenomena	1=Health	1.1=Morbidity rates increment (intestinal, respiratory, skin, eye diseases), 1.2=loss of human lives, 1.3=health centers abandoned, 1.4=more accidents	
	2=Agriculture and cattle farming	2.1=Plagues and diseases proliferation, 2.2=loss of livelihoods, 2.3=loss of crops and cattle	
	3=Domiciliary services	3.1=Power cuts, 3.2=water supply shortages, 3.3=infrastructure collapse	
	4=Housing	4.1=Loss of homes and real properties, 4.2=home devaluation, 4.3=home damage, 4.4=discouragement of investments for home improvement	
	5=Tourism	5.1=Reduction of beach areas, 5.2=Reduction of Tourism	
	6=Environment	6.1=Forest fires, 6.2=loss of species, 6.3=alteration of soil characteristics, 6.4=water scarcity	
	7=Fishing	7.1=Reduction of fish	
	8=Transportation and mobility	8.1=Traffic chaos, 8.2=physical isolation, 8.3=Road infrastructure damages	
	9=Education	9.1=children miss school	



Question	Data Grouping	Description/Additional Detail	Detail Not Analyzed in Pivot Tables
	10=Other	10.1=Food scarcity, 10.2=fear	
	101=Floods		
	102=Landslides		
	103=Drought		
	99 = Not known/Not answered		
	100=Unclear		
9. Existing programs/projects that you are aware of that address the impacts of climate change phenomena on the city	1=Water infrastructure improvement		1a=Storm water system installation
	2=Coastal zone management		2a=coastal monitoring, 2b=cleaning of overpopulated algae
	3=Disaster risk management		3a=Early warning, 3b=relocation of risk-prone settlements, 3c=risk mapping, 3d=flood management (river rerouting), 3e=safier houses building, 3f=slum formation control, 3g=formulation/implementation of risk management plans, 3h=slum upgrading, 3i=implementation of stations and information systems, 3j=formulation/implementation of national plans for climate change adaptation, 3k=creation of climate change/risk management unit, 3l=coastal protection
	4=Public awareness raising		4a=Environmental education, 4b=training
	5=Watershed management		5a=Land acquisition, 5b=reforestation 5c=river-bed cleaning
	6=Health campaigns		6a=Anti-dengue
	7=Other		7a=dams construction, 7b=fundraising, 7c=research on climate change related-topics, 7d=road infrastructure maintenance
	8=Not-question related	Answers pertaining to programs/projects that address climate change mitigation	8a=Power saving, 8b=solid waste management, 8c=motor vehicle modernization, 8d=discouragement of car use
	99 = Not known/Not answered		
100=Unclear			
10. Changes that have been made	1=Transportation		1a=Motor vehicle modernization
	2=Spatial planning		2a=Land use regulation



Question	Data Grouping	Description/Additional Detail	Detail Not Analyzed in Pivot Tables
to existing programs in light of the impacts of climate phenomena in the city			improvements, 2b=building codes modified, 2c=consideration of the climate change topic in urban development plans, 2d=reclassification of land use zones
	3=Water and sanitation		3a=Climate change-related variables included in water supply and sewerage master plans, 3b=Implementation of periodic infrastructure maintenance
	4=Environment		4a=Setting of water management as a priority in the government's agenda, 4b=setting of natural areas conservation as a priority, 4c=environment development plans implemented (e.g. for those projects that affect negatively the environment), 4d= increased coverage of programs concerning energy efficient use, 4e=coordinated work with locals to control algae population in coastal areas, 4f=new regulations related to gas emissions by the industry, 4g=increased coverage of programs concerning water efficient use, 4h=more environmental education programs implemented, 4i=water shed management (including reforestation)
	5=Institutional set-up		5a=Institutional integration and coordination toward disaster risk management, 5b=institutional framework modifications (e.g. municipal Units in charge of environmental management and disaster risk management have been created), 5c=more political will
	6=Disaster risk management		6a=Guidelines adjusted and contingency plans updated, 6b=increased interest in risk management, 6c=promotion of civil society organization for disaster prevention, 6d=new infrastructure for floods and landslides management, 6e=infrastructure built with new technologies, 6f=more money allocated for risk management infrastructure,



Question	Data Grouping	Description/Additional Detail	Detail Not Analyzed in Pivot Tables
			6g=early warning system implemented, 6h=settlement relocation
	7=Health		7a=Anti-dengue program became permanent and not seasonal, 7b=more attention to respiratory diseases
	99 = Not known/Not answered		
	100=Unclear		
11. Strategies, programs or studies that have been undertaken or are under development in your city specifically to promote adaptation to the impacts of climate change i.e. long-term adjustments to the impacts or likely impacts of climate events attributable to anthropogenic climate change	1=Water infrastructure improvement		1a=Water storm system implementation/improvement
	2=Public awareness raising		2a=Environmental education
	3=Energy efficiency promotion		3a=Building of energy efficient houses, 3b=alternative energy use (solar)
	4=Water shed management		4a=Land acquisition, 4b=reforestation, 4c=river bank maintenance and river-bed cleaning
	5=Spatial planning		5a=Reclassification of land use zones, 5b=land use plans implementation/update, 5c=open space creation, 5d=land use regulation (e.g to strictly forbid specific land uses)
	6=Planning instruments	Formulation/implementation of planning instruments for climate change adaptation	6a=Local climate change adaptation plan/strategy, 6b=National plans/policies
	7=Collaborative agreements		7a=Alliances between governmental and non-governmental organizations for natural resources conservation
	8=Law enforcement		8a=Penalties for destroying the natural protected areas
	9=Increased research	Increased research on the climate change realm	9a=Climate scenarios, 9b=urban poverty and climate change linkages, 9c=assessment of climate change impacts (including economic), 9d=analysis of climate change vulnerability, 9e=climate change adaptation, 9f=identification of crops resistant to droughts, 9g=climate change monitoring, 9h=creation of climate change research units/networks
	10=Clean development mechanisms	Implementation of clean development mechanisms	10a=Methane capture



Question	Data Grouping	Description/Additional Detail	Detail Not Analyzed in Pivot Tables
	11=Changes in urban transportation		11a=Changes in urban transportation routes, 11b='car free day' campaigns
	12=Disaster risk management		12a=formulation/implementation of risk management plans, 12b=creation of risk management units, 12c=settlement relocation, 12d=risk mapping
	99 = Not known/Not answered		
	100=Unclear		
<p>12. Training or meetings city officials have been involved in relevant to the impacts of and adapting to climate change</p> <p><b>Note:</b> -Question understood in two different ways: participation of municipal authorities in training activities as <b>recipients</b> or <b>providers</b> of it.</p>	<b>Training</b>	Including assessment	
	1=Climate change impacts		
	2=The science of climate change		
	3=Sustainable development		
	4=Climate change adaptation	Specifically on how to face floods	
	5=Millennium Development Goals		
	6=Greenhouse effect		
	7=Climate change variability	"El Niño" phenomenon	
	8=Risk management		
	9=Urban mobility		
	10=Dengue prevention		
	11=Climate change mitigation		
	12=Clean development mechanisms		
	13=Other		
	<b>Meetings A&amp;B</b>	ICLEI World Mayors Summit of Climate Change, COP15, discussions and provision of recommendations	a=International b=Regional / not- defined
99 = Not known/Not answered			
100=Unclear			
13. Do you consider the adoption of policy measures to adapt to the impacts of climate change:	1=Urgent		
	2=Important, but not of immediate concern		
	3=Important, but other urban development issues should take priority		
	4=Not important at		



Question	Data Grouping	Description/Additional Detail	Detail Not Analyzed in Pivot Tables
	this time		
	5=Other		
	99 = Not known/Not answered		
14. Main barriers to further work on climate change adaptation in the city	1=Civil society commitment		
	2=Law and regulation development	Lack of climate change-related policies, regulations and control.	
	3= Technical staff		
	4=Other urban and environment development priorities		
	5= Planning	Short term vision, unfeasible programs, highly centralized, no concrete projects	
	6=Political will		
	7=Information/Knowledge	About climate change effects, adaptation measures, existing programs	
	8=Finance	For better infrastructure, research	
	9=Awareness	Of citizens and policy makers	
	10=Inter-institutional/sectoral work	People and decision makers believe its impacts will only be felt in the future	
	11=Climate change is not a concern	Example: This issue does not generate votes	
	12=Other		
	99 = Not known/Not answered		
100=Unclear			
<b>SECTION 2</b>			
15. Population Size  <b>Note:</b> -While pivot table data was coded along these parameters, tables are grouped by 4 categories: <50,000 50,000-500,000 0.5-1 million >1 million	1=<50,000		
	2=50,000-100,000		
	3=100,000-250,000		
	4=250,000-500,000		
	5=0.5-1 million		
	6=1-5 million		
	7=5-10 million		
	8=>10 million		
	99 = Not known/Not answered		
	100=Unclear		
16. Geographic location	1=Coast		
	2=Mountain		



Question	Data Grouping	Description/Additional Detail	Detail Not Analyzed in Pivot Tables
	3=Valley		
	4=River shore		
	5=Lake shore		
	6=Forest, Rain Forest/Amazon		
	99 = Not known/Not answered		
	100=Unclear		
17. Climate phenomena	1=Drought		
	2=Storm/heavy rain		
	3=Snowfall		
	4=Hurricane		
	5=Heat wave		
	6=Hail		
	7=Gale		
	8=Frost		
	9=ENSO	ENSO stands for El Niño/ Southern Oscillation. El Niño is the warm phase of the ENSO Cycle, whereas La Niña is the cold one	
	10=Temperature fluctuation		
	11=Climate change effects	flooding	
	12=Other		
18. Key economic activities	99 = Not known/Not answered		
	100=Unclear		
	1=Commerce		
	2=Tourism		
	3=Industry		
	4=Services		
	5=Fishing		
	6=Agriculture		
	7=Cattle farming		
	8=Mining		
19. Description of governing structure	9=Building sector		
	10=Other		
	1=Mayor and City Councilors elected		
	2=Provincial Government elected	President, Province Councilors	