Urban Climate Resilience:
A Global Assessment of City Adaptation Plans

By

Kristina Noel Katich

Bachelor of Design in Architecture
University of Florida
Gainesville, Florida (2003)

Submitted to the Department of Urban Studies and Planning
in partial fulfillment of the requirements for the degree of

Master in City Planning

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2009

Author_____
Department of Urban Studies and Planning
May 21, 2009

Certified by _____
Professor JoAnn Carmin
Department of Urban Studies and Planning
Thesis Supervisor

Accepted by_____
Professor Joseph Ferreira, Jr.
Department of Urban Studies and Planning
Chair, MCP Committee

Urban Climate Resilience:
A Global Assessment of City Adaptation Plans

By

Kristina Noel Katich

Submitted to the Department of Urban Studies
on May 21, 2009 in Partial Fulfillment of the
Requirements for the Degree of Masters in City Planning

Abstract

As policy makers accept climate change as an irrefutable threat, adaptation planning has emerged as a necessary action for countries, states, and municipalities.

This thesis explores adaptive responses to climate change in 17 cities, comparing municipal plans created to "battle" a global problem at the local level. Incorporating capitals and megacities from both the developed and developing worlds, this analysis studies whether municipal responses to the impacts of climate change adhere to the conventional understanding of who needs to adapt and how they are planning for adaptation. The three assumptions challenged in this analysis are (1) that mitigation is primarily a responsibility of the global north while adaptation is the primary response of the global south, (2) that adaptive action is planned in response to vulnerability, and (3) that mitigation action and groups pave the way for subsequent adaptation through the creation of knowledge and global networks on climate issues.

Through a comparison of the levels of resource and hazard assessment, objective frameworks, levels of coordination, citizen involvement mechanisms, and concern for equity that city governments are using to develop climate action plans, I argue that municipalities are not using the resources and priorities ascribed to them by the global community. Instead, global networks and programs, as they are now, encourage the creation of perfunctory adaptation statements, rather than specific actions. Global mitigation relationships are effectively muddling and suppressing the creative development of local strategies for climate change adaptation.

Keywords: climate change, adaptation, resilience, vulnerability, municipal adaptation plan, city adaptation plan, risk

Thesis Supervisor: JoAnn Carmin
Title: Associate Professor of Environmental Policy and Planning

Thesis Reader: Diane E. Davis
Title: Professor of Political Sociology

Acknowledgements

I would like to take this opportunity to thank the many people who contributed to my research and the development of this thesis.

First and foremost, my gratitude goes to Professor JoAnn Carmin, my advisor, for her comments, patience, and enthusiasm during the evolution of my research; I never would have made it this far without her support and insights on climate adaptation. I would like to thank my reader, Professor Diane Davis, for introducing me to México City; the friends and memories I made there influenced my MIT experience more than anything else. I am also indebted to Professor Aseem Inam for encouraging my research and comparative framework when I needed it the most.

I would also like to thank the MIT MISTI México Program and the Department of Urban Studies and Planning for providing the financial support for my field research.

I would like to thank the many people who met with me for interviews during the course of this project. My research was greatly enriched by the information and insights they provided about their work in climate change planning. A list of interview participants and their affiliations may be found in Appendix D.

Additionally, I would like to thank my family for encouraging my education and making me inquisitive and pertinacious. Also, I would like to thank my friends, who inspire me to be as awesome as possible, every day.

Finally, this thesis is dedicated to Javier Lindel Garza, who tragically passed away on March 16, 2009. As my supervisor and mentor in the Peace Corps, you emboldened me to help others, no matter the obstacles. You lived a life of service, and we miss you greatly.

Table of Contents

List of Figures

List of Tables

Acronyms and Abbreviations

ACT	Australian Capital Territory
ARG	Argentina
AUS	Australia
BAPA	Buenos Aires Plan of Action
CAN	Canada
CCI	Clinton Climate Initiative
CCAP	Singapore's Climate Change Awareness Programme
CCP	Cities for Climate Protection Campaign
CDM	Clean Development Mechanism
C40	Cities Climate Leadership Group
COP	Conference of Parties (to the UNFCCC)
DC	Developing Country, in the UNFCCC context
DF	*Distrito Federal*, the Federal District of México City
ECU	Ecuador
ESP	Spain
FRA	France
GEF	Global Environment Facility
GCM	global climate model
GHG	greenhouse gas
GNP	gross national product
ICCC	Inter-Ministerial Commission on Climate Change
ICLEI	International Council for Local Environmental Initiatives
INC	Intergovernmental Negotiating Committee
IPCC	Intergovernmental Panel of Climate Change
IPCC4	IPCC Fourth Assessment Report
IRL	Ireland
GBR	United Kingdom
JPN	Japan
LCD	least developed country
LCDF	Least Developed Country Fund
MAP	Municipal Adaptation Plan
MEX	United States of Mexico
MGD	Millennium Development Goal
NAPA	National Adaptation Programme of Action
NGO	Non-governmental organization
NZL	New Zealand
OECD	Organisation for Economic Co-operation and Development
SCCF	Special Climate Change Fund
SGP	Singapore
SWE	Sweden
THA	Thailand
UN	United Nations
UNCEP	United Nations Conference on Environment and Development

UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UPROSE	United Puerto Rican Organization of Sunset Park (Brooklyn, NY)
VCA	vulnerability capacity analysis
WCED	World Commission on Environment and Development (Brundtland Commission)
WHO	World Health Organization
WMO	World Meteorological Organization
UKCIP	United Kingdom Climate Impacts Programme
USA	United States of America
ZAF	South Africa
ZMVM	*Zona Metropolitana del Valle de México*, Metropolitan Zone of the Valley of México

Chapter 1: Introduction

The inevitableness of climate change is still a debated topic in some political and scientific communities. However, working under the assumption that climate change is happening, and moving forward with projected climate models based on current and past weather fluctuations allows some countries, regions, and cities to prepare for the impending changes in their environment. Responses range from efforts to mitigate carbon emissions to strategic plans for adapting to the changing climate.

This thesis explores adaptive responses to climate change in 17 cities, comparing municipal plans created to "battle" a global problem at the local level. Incorporating capitals and megacities from both the developed and developing worlds, this analysis studies whether municipal responses to the impacts of climate change adhere to the conventional understanding of who needs to adapt and how they are planning for adaptation. The three assumptions challenged in this analysis are (1) that mitigation is primarily a responsibility of the global north while adaptation is the primary response of the global south, (2) that adaptive action is planned in response to vulnerability, and (3) that mitigation action and groups pave the way for subsequent adaptation through the creation of knowledge and global networks on climate issues.

Supported through the literature, these three assumptions imply that adaptation is primarily required in the vulnerable cities of the global south. Beginning with the Rio Summit and the division of countries into the categories of Annex 1, Annex 2, and Developing Countries, mitigation was classified as a northern activity (Schipper 2009). Rather than burden developing economies with mitigation restrictions, the UNFCC sought to protect and supplement these vulnerable environments with funding and

support. Additionally, Annex 2 countries were instructed to fund adaptation efforts in the Developing Countries.

Perceived vulnerability was therefore set up as the primary driver in adaptation planning (Satterthwaite 2007). Finally, cities view mitigation networking as a clear example of climate action. These networks are seen as a gateway to adaptation planning, as they create relationships to exchange information on climate change and successful strategies. Additionally, these networks are seen as critical because climate change is not confined to a specific municipality or region (Ribot 2009).

In every sense, climate change is a formidable foe for human settlements. In many ways, global warming is repackaging, if not intensifying, many of the same illnesses that city governments and planners already struggle to cure. Issues of scientific uncertainty and the political economies of resource use and entitlement make it difficult for policy makers to understand the concepts of vulnerability and risk of both socio-economic and natural systems. The right to develop and rapid urbanization processes expand these vulnerabilities, leaving many citizens exposed to the threats of everything from seasonal water shortages to forced migration. Finally, many decision makers lack the capacity to understand their community's level of risk, and the governance or management practices at the local or national level may leave them unable to be proactive rather than reactive to climate change (Sairinen and Peltonen 2005).

Unfortunately, the same long-term planning and uncertainty that make climate change action programming difficult renders qualitative assessments of adaptation plans premature and overly assumptive. However, contemplating the approach that decision makers apply to climate action does provide insight on the values and prevailing views

currently shaping adaptation planning. Despite conventional wisdom, a systematic comparison of the frameworks city governments are currently using demonstrates that municipalities are not utilizing the resources and priorities ascribed to them by the global community to develop climate adaptation plans. Instead, global networks and programs, as they are now, are muddling and suppressing the creative development of local strategies for climate change adaptation. Instead of creating models on which cities can build adaptation plans, global climate networks are slow to shift from mitigation to adaptation (Roberts 2008). Due to the environmental pressures related to funding, laws, uncertainty, and professionalization, governments feel the need to conform to a mitigation model, and therefore emulate plans or organizations they perceive as legitimate or successful (DiMaggio 1991).

While there may be some disconnect between formal adaptation planning and what is happening on the ground, the value of analyzing these plans lies in how cities and governments learn to preempt challenges. Reactively adapting to change is something that humans and ecosystems have always done. Urban centers grow because proactive individuals see opportunity in the uncertain economic landscape of cities (City of New York 2008). Today, the question for scholars, scientists, and policy makers is how can society proactively adapt to long-term yet acute challenges such as climate change? The answer is to build resilience into the system, giving human settlements the tools they need to overcome the unexpected.

In this thesis, I address how adaptive action is integrated into the mitigation, vulnerability, planning, or development frameworks of 17 cities. First, I will provide an overview of climate change issues, to define how adaptation relates to other forms of

climate action. This background begins with the definitions of the critical climate action vocabulary and a chronological development of adaptation concerns in the international climate change arena. The overview continues with discussions of the mitigation/adaptation dichotomy, issues of urban vulnerability, the importance of local specificity, and the relationships between governments and communities.

Second, I outline the data and methods used to analyze the adaptation actions. This includes the scope that guided the collection of these plans, and the framework for the analysis. The tables and figures of chapter 4 outline the characteristics of the plans and their respective case study cities. The level of adaptation integration is compared to the type of plan in order to compare the development of adaptation action in each city.

In chapter 5, I compare these strategies through their levels of resource and hazard assessment, objective framing, implementation planning, inter-organizational coordination, citizen engagement mechanisms, and concern for equity. The plans are organized in each analytical section in ascending order and contrasted with the prevailing wisdom of climate adaptation planning in each.

Finally, chapter 6 is a summary in which I summarize the key adaptation trends identified this analysis. These are organized in relation to the three assumptions challenged in this study concerning who needs to adapt to climate change, why they are creating adaptation plans, and the relationship between mitigation and adaptation action. These findings are then used to suggest ways that municipal planners may improve existing and future efforts in adaptation planning.

Chapter 2: An Overview of Climate Change Issues

In order to understand how cities are approaching adaptation planning, and how it is related to other climate issues such as mitigation, it is important to first identify the terms, key players, and chronological development of climate action. In this chapter I define critical vocabulary and an overview of the evolution of climate action.

The Climate Change Vocabulary

The following terms are critical in the discussion of climate change action. As defined by the Intergovernmental Panel on Climate Change (IPCC), mitigation, "attempts to deal with the causes of climate change. It achieves this action through actions that prevent or retard the increase of atmospheric greenhouse gas concentration by limiting current and future emissions from sources of greenhouse gases and enhancing potential sinks," (IPCC 1996). Alternatively, adaptation, "is concerned with responses to both the adverse and positive effects of climate change. It refers to any adjustment – whether passive, reactive, or anticipatory – that can respond to anticipated or actual consequences associated with climate change. It thus implicitly recognizes that future climate changes will occur and must be accommodated in policy," (IPCC 1996).

Similarly, resilience, "is about how a system copes with major perturbations to its operating environment," (Handmer and Dovers 2009). Inversely coupled to resilience is the concept of vulnerability. The IPCC working definition for vulnerability is, "the degree to which a system is susceptible to, or unable to cope with, the adverse effects of climate change, including variability and extremes. Vulnerability is a function of the

character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity," (Burton, S. Huq et al. 2009). The IPCC defines adaptive capacity as, "the ability of the system to adjust to climate change, including climate variability and extremes, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences" (Burton, S. Huq et al. 2009).

An International Roadmap Towards Climate Adaptation

Since the 1960s, climate change has evolved from a disputable scientific issue to the biggest challenge facing our century today (Kirby 1999). While skeptics remain, the broader community has accepted that the global climate is changing, and the issue has moved beyond the realm of scientific research, into the realm of policy and popular culture. The process has been slow, but the climate change issue has grown towards the field of adaptation over the last 50 years.

The first international initiative to create a non-biased source for scientific and socio-economic climate change information was the creation of the IPCC in 1988 (IPCC). Established by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), the IPCC does not carry out its own research, and is internationally viewed as the authority on climate change issues.

Today, IPCC focuses its reports to support the United Nations Framework Convention on Climate Change (UNFCCC), the first international climate change treaty. The UNFCCC was created at the 1992 meeting of the United Nations Conference on Environment and Development (UNCED), also known as the Rio Earth Summit. It is the

UNFCC that definitively recognized that climate change could have harmful effects, and categorized mitigation and adaptation as the two responses to climate change. The countries participating in the UNFCCC are split into three groups: Annex 1, Annex 2, and Developing Countries. Annex 1 countries are those industrialized countries that seek to mitigate their green house gas (GHG) emissions to 1990 levels. Annex 2 countries are a subset of Annex 1, comprised of countries that will pay mitigation costs in Developing Countries. This group excludes economies in transition, and is largely comprised of OECD states. Finally, Developing Countries are those that are not expected to reduce their emissions without Annex 2 payment, so as to not limit economic development in these countries (DiMento and Doughman 2007). The signatories of the UNFCCC meet annually at the Conference of Parties (COP) to assess progress on climate change issues and create additional agreements, or protocol. By far, the most well known of these, the Kyoto Protocol, was created in 1997 at COP3. The Kyoto Protocol (Kyoto) was the first legally binding limit set on GHG mitigation, and was never ratified by the United States (DiMento and Doughman 2007). Up to this point, it is clear that the UNFCCC has placed a clear priority on mitigation, as adaptation is rarely mentioned in reports (Schipper 2009).

Over the next few years, most international efforts continued to be focused on the ratification of Kyoto. In addition to supporting Kyoto, the 1998 Buenos Aires Plan of Action (BAPA), created by COP4, was the first formal recognition of the need for adaptation in Developing Countries. The Marrakech Accords (Marrakech) in 2001 (COP7) established the Special Climate Change Fund (SCCF) and the Least Developed Countries Fund (LDCF) to help Developing Counties fund adaptation measures.

Marrakech also provided guidelines for the preparation of National Adaptation Programmes of Action (NAPAs) within the Least Developed Countries (LDCs). Organized by sector, these plans sought to provide a process for LDCs to identify and prioritize their adaptation demands (Burton, S. Huq et al. 2009). It is during this time that the Annex 1 countries began to question the lack of mitigation in Developing Countries, and adaptation is labeled as an issue of the global south (Schipper 2009).

During 2005, Kyoto went into effect without the United States' participation. That same year, several major storms, including Hurricane Katrina, set off a new debate concerning the relation between global warming and storm intensity. The economic and human losses incurred coincided with a growing concern of climate vulnerability. The following year, the Stern Review on the Economics of Climate Change (Stern Review) was released, outlining that the benefits of early action on climate change largely outweighed the cost, and that the negative impacts would be worse for the global poor (Stern 2006). Despite critiques, the Stern Review is cited as a turning point in the public acceptance of global warming, and a proponent of climate change action.

The IPCC Fourth Assessment Report (IPCC4), released in 2007, reinforces this public acceptance with the declaration that the, "warming of the climate system is unequivocal" (IPCC 2007). That same year, COP 13 accepts global warming as inevitable, despite previous mitigative action, and declares the need to respond with adaptation action to reduce vulnerability. The Bali Roadmap and Action Plan (Bali) established adaptation as one of the four issues that would form the base for a binding agreement created at the 2009 meeting of COP15, designed to take over when Kyoto period ends in 2012 (Schipper 2009).

Mitigation Versus Adaptation?

Throughout the development of climate action is the apparent dichotomy between mitigation and adaptation. This conflict is seen in climate literature, policy and even climate science, despite the fact that they are not mutually exclusive (Schipper 2009). Listed as 'complement' to mitigation as well as a 'very powerful option' for climate action, adaptation has long been framed as secondary to mitigation by both the IPCC and UNFCCC (Pielke Jr. 2009).

An ideal approach to climate action would marry mitigation and adaptation. However, several issues make this an ignored union in the realm of policy, as decision makers continually focus on mitigative strategies to battle climate change. First, adaptation may be ignored because proposing adaptation in some ways signals that governments have given up on our efficacy in mitigation (Schipper 2009). Admitting 'defeat' risks decreasing global determination to decrease GHG emissions. Second, to propose adaptation assumes that climate change is happening. As shown through the slow development of climate action, there has always been a steady group of climate change critics and a large amount of scientific uncertainty (Schipper 2009). Third, any government discussing the need for adaptation or adaptation funding could be perceived as shirking their mitigative responsibilities or claiming responsibility for climate change, respectively (Schipper 2009). The fourth barrier to adaptive planning is a perceived lack of urgency. Climate change is a slow process and an emerging crisis, making it difficult to garner the political will to act when faced with more urgent demands.

Despite these barriers and the UNFCCC framing mitigation and adaptation in this manner, there has been a gradual shift in accepting the need for adaptation, largely in the global south.

Issues of Urban Vulnerability

While early adaptation research revolved around the susceptibility of small coastal communities and agriculture, there is a growing literature on the effects of climate change on urban centers. In addition to being economic, social, and cultural hubs, cities are frequently the location of environmental and economic resource inequality. Urban centers are vulnerable on multiple levels, due to physical infrastructure, population concentration, the health impacts of density, and the distribution of services such as water (Aguilar 2004). It will take the cooperation of the state, civil institutions and citizenry to creatively and justly prepare for changes in climate in all countries. It is important to establish a policy agenda in development that will support adaptive capacity in vulnerable communities (Adger, S. Huq et al. 2003)

The very nature of the urbanization process contributes to the vulnerability of communities. In megacities in the developing world, one example of the fragile relationship between humans and the natural environment can be seen in the burgeoning irregular settlements located on the periphery of cities as they transition from agricultural to industrial economies. Small and medium sized cities also face issues of urbanization, and may lack the capacity and knowledge to cope with "new" challenges such as the impacts of climate change.

Before action, governments and planning authorities in both industrialized and developing nations are forced to decide exactly how vulnerable they are to the risks of climate change. Vulnerability is largely defined in relation to the ability of communities or individuals to react to the external forces on their wellbeing (Kelly 2000). This reaction may be proactive or reactive. The IPCC has assessed that climate change impacts will not be distributed evenly, and those social groups with the fewest available resources will bear a larger percentage of the burden (Adger, S. Huq et al. 2003).

Global Versus Local Action

There are a series of difficulties surrounding climate change politics. The two primary questions concern issues of scale. First, there is the question of what political entity is equipped to establish a plan to deal with a broad issue such as climate change. Second, there is the question of what political entity is equipped to implement established plans. There are benefits and challenges to climate change action at both the national and sub-national levels. However, one of the most important indications of success in any climate plan is the amount of multilevel government interaction and coordination taking place.

In favor of national and supranational climate change planning, there are arguments that many related issues, such as technology standards, energy pricing, industrial efficiency standards, and building codes are frequently handled through federal or supranational policies (Schreurs 2008). By managing climate change issues at the same scale, it can streamline interactions between offices. An additional benefit of national level climate planning is the availability of funding. In many case, national

governments have more access to financing for undertaking large infrastructure related projects.

Despite the strengths of national level climate planning, there is an understanding that there are growing benefits to focusing on city and regional climate planning, partially because it is easier to implement both national and local plans at the local level (Schreurs 2008). In many ways, local action may form because of the lack of national leadership on climate change. In the case of the United States, cities and states became more proactive when the national government failed to establish a climate action agenda. This "bottom-up governance" has helped accelerate the rate at which new plans are introduced (Wheeler 2008). States such as California, Oregon, and Washington in addition to some New England states introduced energy efficiency programs and climate change mitigation policies in response to the federal government's failure to ratify Kyoto (Schreurs 2008). Global information networks have formed around the issue of climate change, such as the C40 Large Cities Group, the West Coast Governor's Global Warming Initiative, the International Council for Local Environmental Initiatives - Local Governments for Sustainability (ICLEI) Cities for Climate Protection (CCP) Campaign, and the Clinton Climate Initiative (CCI). These global networks are strengthening the capacity of cities and regions to plan for climate change in lieu of national government action (Schreurs 2008). The diffusion of policy ideas in such networks allows cities and states to become pace setters, inspiring local action in cities without the guidance of a national action plans. Up to this point, many of these global networks have been focused on mitigation efforts. However, ICLEI has recently launched an adaptation pilot program in the United States (ICLEI USA 2009).

In addition to plans on climate action, many cities and regions are beginning to take action on climate change without an explicitly named plan. Many times, these actions form out of an overall sustainability or development initiative focusing on maintaining biodiversity, generating renewable energy portfolios, or the fulfilling the MDGs.

Figure 1: Action on Climate Change

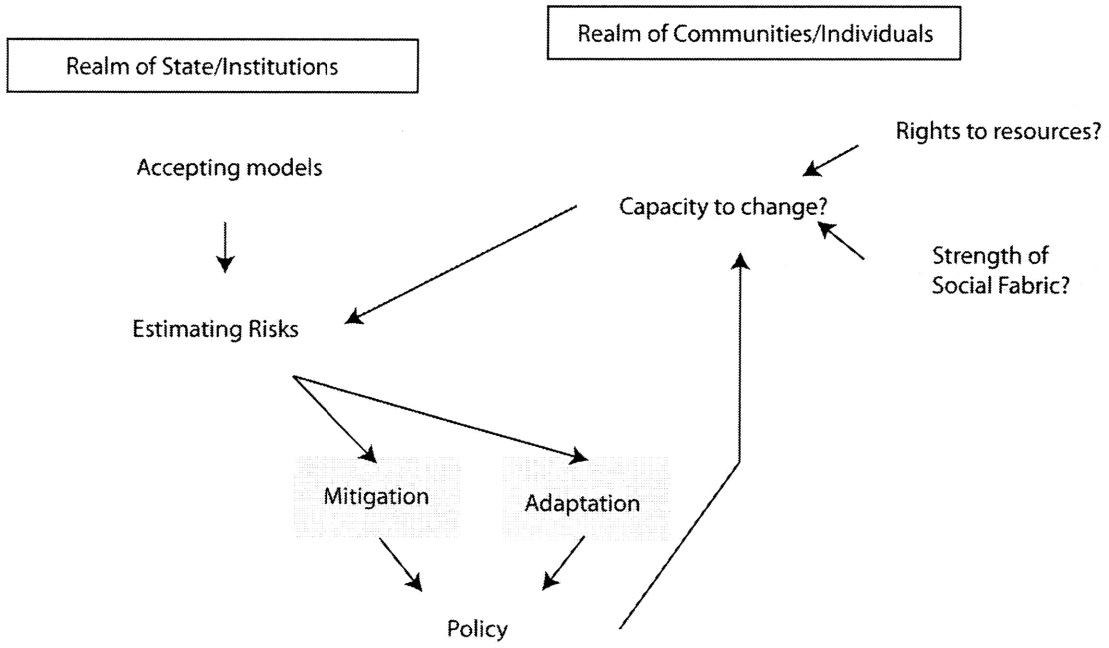


Figure 1 illustrates how communities and institutions relate in the realm of climate change action. For communities and individuals, social networks and the right to resources buoy their capacity to cope with environmental change. For states and institution, they are following a framework, where they must accept climate models in estimating the risks present for their constituency, and systematically decide whether to

engage in mitigative, adaptive, or a combination of these actions to confront anticipated changes. Cyclically these changes impact the community's capacity to cope. Slow or uninformed decision making on the institutional level adversely affects a community's resilience. Equally, it is important for the institutions to understand the community's capacity to change when deciding how to create local climate policy.

How can we adapt?

As a global issue requiring local action, climate change is a new variety of challenge. While mitigation action may not reap local benefits, adaptation will. In order to create effective adaptation policy, it is important for planners to approach climate adaptation in a comprehensive and inclusionary manner. Climate change is going to alter our environment in nuanced ways, and while the natural environment and individuals have the ability to autonomously adapt, our built environments and political constructions do not. It is important for adaptation to be planned at the local level, through agencies that have the capacity to influence and coordinate autonomous and planned adaptation by all sectors.

Chapter 3: Data and Methods

In order to understand if municipal responses to the impacts of climate change adhere to our conceptual understanding of who needs to adapt and how they are planning for adaptation, this study involved the collection and coding of climate action plans from around the world in addition to field research. Every explicit form of climate action was searched to understand the relationships between the spatial distribution, vulnerability responsiveness, and temporal development of different methods of action.

Working under the assumption that cities with higher population densities have a higher need to adapt to the future effects of climate change, I first searched for climate plans in the world megacities. Megacities, as defined by the United Nations, are urban agglomerations with populations over 10 million (UN-Habitat 2007). A full list of these cities can be found in Appendix A.

Assuming that perhaps population density was not the only impetus in creating climate action plans, I questioned if another resource, such as government centers, may be considered among the first to plan for climate adaptation. While not all countries have megacities, nearly every country has at least one government seat. Systematically I then searched for climate action plans of the 196 country capitals. I included all capitals in countries such as South Africa and Bolivia, which have multiple capitals. Sovereign city-states were included in this search while non-sovereign city-states were not included unless they are already considered the capital for their ruling nation. A full list of these cities can be found in Appendix B.

The search for climate action plans was conducted through the Internet, in order to focus on those plans that are publicly available. Case selection of climate adaptation plans began with a systematic Internet search using the Google search engine (www.google.com). Key search terms used were "climate change," "action," and "plan," in English. In specific cases where English is not the operational language of those cities, comparable Spanish, French, Portuguese, or Italian translations of those search terms were used. This linguistic restriction is based purely on the researcher's ability to read and process the information found in the search. The first 100 results for every search were then considered for further investigation, based on their apparent relevance to the topic. When the first 100 results included links for websites operated by city governments or international climate change initiatives, these sites would receive additional review, seeking links to general plans that may include climate action or international agreements that symbolize a city's interest in climate action. All translations from Spanish, French, Portuguese, or Italian to English are my own. All Google searches were done between the periods of October 2008 and February 2009.

Seventeen plans were returned through this search. Two are exclusively focused on mitigation. The other 15 plans incorporated adaptation elements to varying degrees. In order to evaluate the plans based on conventional principles of good planning and climate adaptation established in the literature, I chose five criteria by which to compare similarities and differences in content. These criteria included assessment of resources and hazards, program objectives and framing, inter-organizational coordination, citizen engagement mechanisms, and concern for equity issues. Tables 4-8 in Chapter 5 describe the actions that were interpreted in this study to fall within these categories. The

development of this protocol allowed a broader range of climatic action to be considered. Evaluating plans in this manner enables us to understand the values and concerns that are shaping decisions in climate action development. By comparing plans, we can understand if there are global trends in adaptation that may benefit other communities.

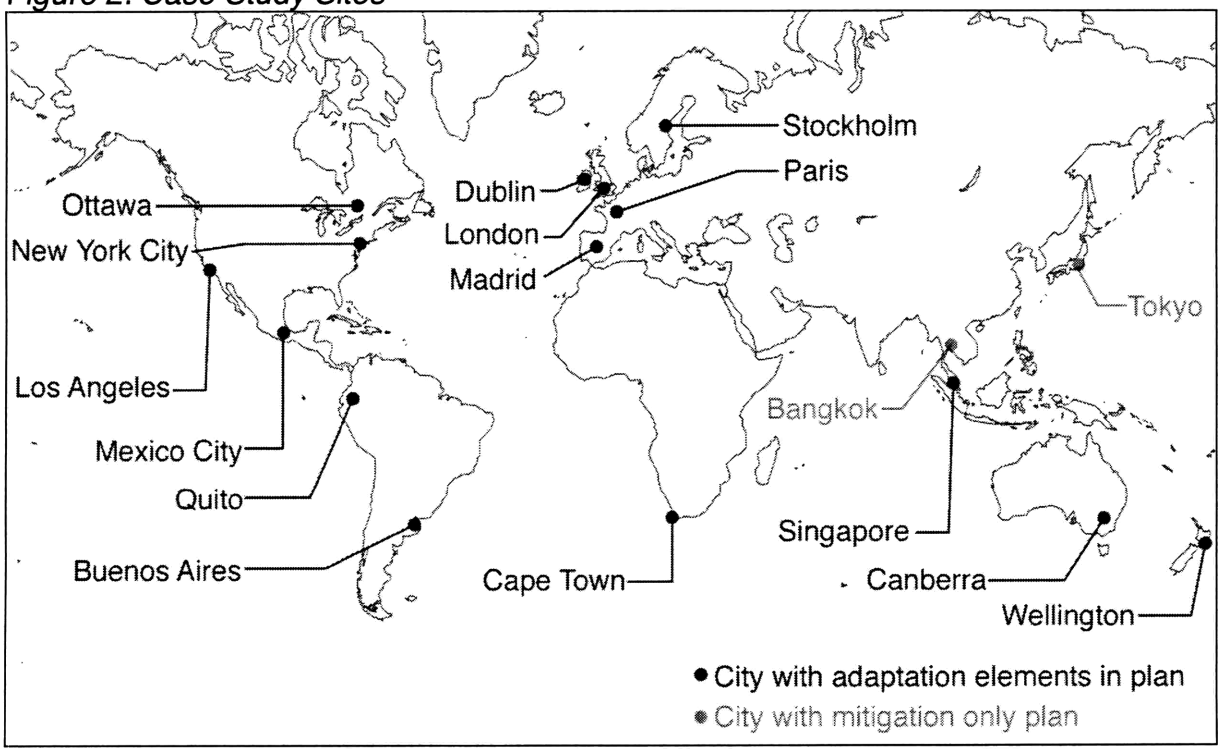
Chapter 4: Adaptation Planning for National Capitals and Megacities

National capitals and megacities are of critical importance to human innovation, global economic development, and international government cooperation. Currently, urban leaders are recognizing the need to respond to climate change through both mitigative and adaptive methods. As cities create mitigation policy, they are simultaneously creating GHGs, and the climate is already changing. Residing in urban centers will not protect citizens from the biophysical impacts of climate change. Rather, these, as well as social and economic impacts, may be amplified by the urban inequities caused by the concentration of different vulnerable groups (Huq 2007). Municipalities are beginning to plan for climate adaptation in different ways, based on their perceived vulnerabilities and needs. The climate change action plans considered in this study were created by and for national capitals and megacities worldwide. The comparison made between plans aims to understand how cities are relating to each other and to the different aspects of climate action, with a focus on adaptation action. In the sections that follow, I review the plans from 15 cities that incorporate climate adaptation, and compare them through their respective priorities and development. In this study, adaptation action is defined as all activities undertaken in an effort to cope with or take advantage of the impacts of climate change. This definition does not include a review of mitigation actions.

Case Study Sites

Of the 196 national capitals, 15 have created plans addressing climate action. The capital cities included in this study represent all continents, and both developed and developing countries (as seen in Figure 2: Case Study Sites). Representing the global south are the plans generated by Bangkok, Buenos Aires, Cape Town, Quito, and México City. From the global north, this study includes Canberra, Dublin, London, Madrid, Ottawa, Paris, Singapore, Stockholm, Tokyo, and Wellington. These administrative centers house both local and national government entities, making climate adaptation critical on multiple scales.

Figure 2: Case Study Sites



In addition to their role as national capitals, Bangkok, Buenos Aires, México City, and Tokyo join Los Angeles and New York City as megacities considered in this study. Rapid urbanization over the last 60 years has increased the number of megacities by more

than 20 fold. UN-Habitat projects that there will be 23 megacities by the year 2015, with more than half of the world population already living in urban settings by 2008 (UN-Habitat 2007). Of the 23 megacities projected by the UN, only these six have publicly available climate action plans.

While drawing huge populations with the promise of opportunity, megacities are also constantly threatened by crises, driven both by nature and humanity (Inam 2005). Climate change, as a manifestation of both human and ecological crises, poses a unique problem to municipal planning agencies and governments as they attempt to prepare for uncertain and accumulative impacts. One of the easiest ways to understand the vulnerability of cities is to reflect on previous crisis events. Table 1 (Comparative Profiles of Case Study Cities) lays out the population and natural hazard history for the case study cities, based on the plans reviewed. No more than a cursory glance is needed to understand that these 17 cities have a history of environmental vulnerability. However, these cities have continued to function, if not grow, despite these risks.

Table 1 creates a profile for each case study city, describing urban center population, density, and previous hazards. This profile provides the environment for adaptation planning. In the case of México City, previous experience with earthquakes and subsidence has prepared not only institutions but individuals for future risks related to ground instability. While climate change is less likely to cause earthquakes than droughts or floods, the 1985 quake undoubtedly impacted the way Mexicans formulated public policy and physically reconstructed their political capital after the devastation of losing almost 10,000 lives in a matter of moments (Inam 2005). In this way, past and

Table 1: Comparative Profiles of Case Study Cities

	City	Population		Natural hazard history*					Demand for land in hazardous areas*
		Urban	Density (/km2)	Flooding	Heat stress	Fires/ Drought	Hurricane/ Winds	Ground Instability	
Global South	Bangkok, THA	6,500,000	6,450	-	-	-	-	-	-
	Buenos Aires, ARG	11,200,000	4,950	Yes	-	-	-	-	Yes
	Cape Town, ZAF	2,700,000	3,950	Yes	Yes	Yes	Yes	-	Yes
	México City, MEX	17,400,000	8,400	Yes	Yes	Yes	-	Yes	Yes
	Quito, ECU	1,500,000	3,150	Yes	-	Yes	-	Yes	Yes
Global North	Canberra, AUS	340,800	1,005	Yes	Yes	Yes	Yes	-	-
	Dublin, IRL	1,075,000	2,950	Yes	-	-	-	-	Yes
	London, GBR	8,278,000	5,100	Yes	Yes	Yes	-	Yes	Yes
	Los Angeles, USA	11,789,000	2,750	Yes	Yes	Yes	-	-	Yes
	Madrid, ESP	4,900,000	5,200	Yes	Yes	Yes	-	-	Yes
	New York City, USA	17,800,000	2,050	Yes	Yes	Yes	Yes	-	Yes
	Ottawa, CAN	860,928	305	Yes	Yes	Yes	-	-	Yes
	Paris, FRA	9,645,000	3,550	Yes	Yes	-	-	-	Yes
	Singapore, SGP	4,000,000	8,350	Yes	-	-	-	-	Yes
	Stockholm, SWE	1,400,000	2,700	Yes	Yes	Yes	Yes	Yes	Yes
	Tokyo, JPN	12,790,000	5,847	-	-	-	-	-	-
	Wellington, NZL	381,900	621	Yes	-	Yes	-	-	-

* as reported by the plans reviewed

Note: Population reported is the urban center or city proper, not metropolitan area.
Sources: Bangkok (National Statistical Office Thailand 2006); Buenos Aires, Paris, Quito, Singapore, Stockholm (City Mayors Statistics 2007); Canberra (Australian Bureau of Statistics 2006); Cape Town (Statistics South Africa 2007); Dublin (Dublin Chamber of Commerce 2009); London (World Gazetteer 2008); Los Angeles, New York City (U.S. Census Bureau 2008); Madrid (El Instituto Nacional de Estadística 2008); México City (Consejo Nacional de Población 2008); Ottawa (Statistics Canada 2006); Tokyo (Statistics Bureau Japan 2008); Wellington (Wellington City Council 2007).

future crises, such as climate change, can ultimately be viewed as an opportunity to improve the resilience of cities through the strengthening of individual and institutional capacities to cope with unwanted change.

Plan Characteristics

Each of the plans reviewed in this study are listed in Table 2 (Adaptation Plan Characteristics) adjacent to their year of publication and generating agency. When comparing the agencies responsible for these plans, the plan publication dates, and plan titles, one begins to understand the diverse paths cities are taking towards climate adaptation.

The majority of plans reviewed in this study were created between 2007 and 2008. Only two plans fall outside of this time period – the plans of Ottawa and Cape Town, whose plans were created in 2004 and 2006, respectively. This temporal clustering signifies a flurry of climate-change-driven planning within these cities during the last two years. In many cases, these plans were created in order to compliment other planning initiatives created by parallel agencies at the national or subnational level.

When comparing the agencies that created these plans, they fall within three major groups: planning departments, environmental/sustainability agencies, and centralized government entities. Ottawa is the only plan created by a planning office, the Planning and Growth Management Department. In comparison to this, eight plans were generated through the municipal environmental or sustainability department. Finally, the remaining eight plans were created through centralized government offices, such as city councils, mayor's offices, or metropolitan administrations. This relatively even

distribution implies that climate change is no longer pigeon holed in the frequently marginalized environmental agencies, and may be incorporated into more integrated strategies.

Table 2: Adaptation Plan Characteristics

	City	Plan Reviewed	Year	Created by
Global South	Bangkok, THA	Action Plan on Global Warming Mitigation 2007 - 2012[1]	2007	City: Bangkok Metropolitan Administration
	Buenos Aires, ARG	Strategic Plan 2008-2012[2]	2008	City: Environmental Protection Agency
	Cape Town, ZAF	Framework for Adaptation to Climate Change in the City of Cape Town (FAC4T)[3]	2006	City: Consultants for the Environmental Planning Department
	México City, MEX	México City Climate Action Program 2008-2012[4]	2008	City: Secretary of the Environment
	Quito, ECU	Quito Strategy against Climate Change[5]	2008	City: Metropolitan Environmental Office
Global North	Canberra, AUS	Weathering the Change: The Australian Capital Territory Climate Change Strategy - Action Plan 1 2007-2011[6]	2007	City: Sustainability Policy and Programs
	Dublin, IRL	Draft Climate Change Strategy for Dublin City 2008-2012[7]	2008	City: Dublin City Council
	London, GBR	The London Climate Change Adaptation Strategy (draft report)[8]	2008	City: Greater London Authority
	Los Angeles, USA	Green LA: An Action Plan to Lead the Nation in Fighting Global Warming[9]	2007	City: Mayors Office
	Madrid, ESP	Plan for Sustainable Energy Use and Prevention of Climate Change of Madrid [10]	2008	City: Madrid Office of the Environment
	New York City, USA	PlaNYC: A Greener, Greater New York[11]	2007	City: Mayors Office
	Ottawa, CAN	Ottawa 2020: Air Quality & Climate Change Management Plan[12]	2004	City: Planning and Growth Management Department
	Paris, FRA	Climate Plan of Paris[13]	2007	City: Paris City Council
	Singapore, SGP	Singapore's National Climate Change Strategy[14]	2008	Nation: Ministry of the Environment and Water Resources
	Stockholm, SWE	Stockholm's Action Programme on Climate Change: Adapting to Climate Change in Stockholm[15]	2007	City: Environment and Health Administration
	Tokyo, JPN	Tokyo Climate Change Strategy: A Basic Policy for the 10-Year Project for a Carbon-Minus Tokyo[16]	2007	City: Tokyo Metropolitan Government
	Wellington, NZL	Wellington City Council Climate Change Action Plan: Creating a Carbon Neutral Council and Community[17]	2007	City: Wellington City Council

Sources: 1. (City of Bangkok 2007); 2.(City of Buenos Aires 2008); 3. (City of Cape Town 2006); 4. (City of México (Districto Federal) 2008); 5. (City of Quito 2008); 6. (Australian Capital Territory 2007); 7. (City of Dublin 2008); 8. (City of London 2008); 9. (City of Los Angeles 2007); 10. (City of Madrid 2008); 11. (City of New York 2008); 12.(City of Ottawa 2004); 13. (City of Paris 2007); 14. (Nation of Singapore 2008); 15. (City of Stockholm 2007); 16. (City of Tokyo 2007); 17. (City of Wellington 2007).

Plan Typology

Unlike the field of national climate action, where international bodies encourage the creation of NAPA, there are no standardized frameworks created for city-based adaptation. Any plan including city-based climate action in capitals and megacities was considered for this study, ranging from broad-based general development plans to dedicated adaptation plans. While this range of plan presentation is reflected in the plan titles in Table 2 (Adaptation Plan Characteristics), Figure 3 (Continuum of Adaptation Action in City-based Planning) further discusses methods of plan presentation.

Figure 3: Continuum of Adaptation Action in City-based Planning

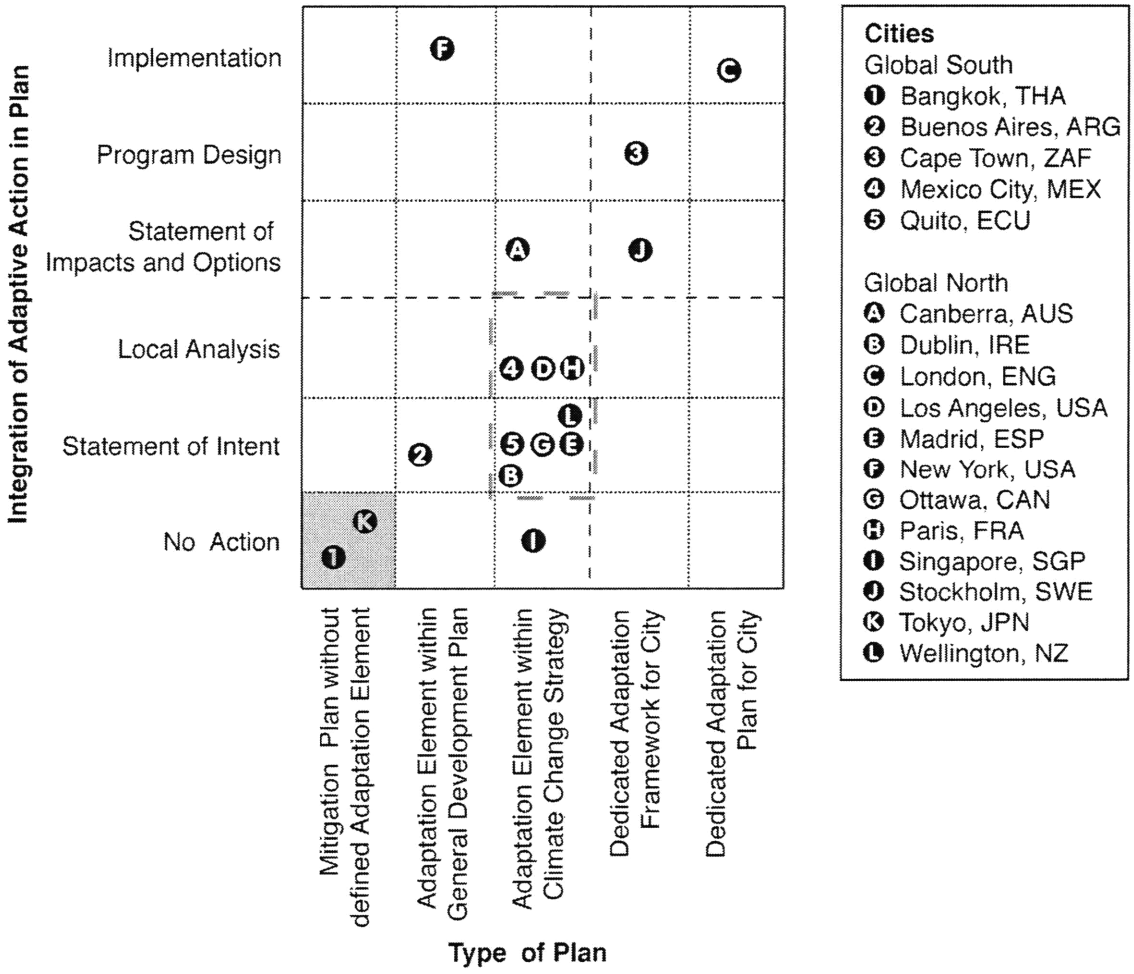


Figure 3, the Continuum of Adaptation Action in City-based Planning, compares plan type with the level of adaptation action integrated into the plan. The Y axis of this figure, 'Integration of Adaptation Action,' reflects the degree to which adaptation action is present in the plan reviewed. These categories are viewed cumulatively, meaning that a plan located in a higher category includes or surpasses the categories below it. Therefore, the category 'No Action' is a baseline category, in which the plans reviewed makes no reference to the need of adaptation to climate change in this city. Moving up the scale, in the 'Statement of Intent' category, plans make reference to vulnerability and the need to cope or adapt. These plans may go as far as promising adaptation action in the future. The category of 'Local Analysis' signals that there is some analysis incorporating climate models and past experience to estimate local vulnerabilities, and there is the intent to adapt. If a plan falls in to the 'Statement of Impacts and Options' category, this plan includes a statement of intent, local analysis, an outline of possible impacts felt locally, and general statements of how this city (or other cities) are acting to respond to these impacts. This is the first category that actually proposes specific adaptation action that is sensitive to local concerns. Including all previous categories, 'Program Design' signals that a plan discusses actual elements of program design, focusing on local vulnerabilities. Elements of program design include detail-oriented items such as budgeting, funding, or project phasing. Additionally, this may include co-opting programs already in existence through other agencies to the adaptation cause, but a plan must include statements of intent, local analysis and local impacts to be included. Finally, 'Implementation' incorporates all previous categories, and implies that there are already some projects or phases of this program underway.

On the X-axis of Figure 3, are the 'Types of Plan;' these designations describe the presentation of plans which include climate action. Unlike the Y-axis, these categories are not cumulative. The first designation, 'Mitigation Plan without an Adaptation Element,' signifies that this plan is focused on GHG reduction, and presented as such. Plans included in this category have titles reflecting the focus on mitigation, such as the 'Tokyo Climate Change Strategy: A Basic Policy for the 10-Year Project for a Carbon-Minus Tokyo.' This category implies that there are no adaptation elements in this plan, and no available adaptation plans in these cities. The Tokyo plan has only three references to coping, and Bangkok has one reference to adaptation, but there is no statement of adaptation intent.

'Adaptation Element within a General Development Plan,' describes a plan with an integrated approach at general planning and development of the city. Climate adaptation is presented as an aspect of this plan, either in chapter or section focused on climate change. Both Buenos Aires and New York are located in this category, but have very different levels of adaptation action. The Buenos Aires plan is a general strategic plan, with one chapter focused on climate action. The chapter is focused on mitigative action and adaptation is only discussed in a cursory manner- they establish the need for adaptation planning, but make no efforts at this time to analyze specific climate vulnerabilities in Buenos Aires nor design policies. The New York plan, on the other hand, is very specific in terms of local impacts, options, project design and has begun to implement some action items.

The following category, 'Adaptation Element within Climate Change Strategy,' describes a plan presented to deal with both mitigative and adaptive aspects of climate

change. A general climate strategy implies that this city did not create separate plans for each response. There are ten plans located in this category, signaling that this is a preferred approach to climate action planning. A large number of these plans are clustered in the 'Statement of Intent' and 'Local Analysis' categories. While producing a general climate strategy may reflect global norms in climate planning, this cluster implies that generalized global adaptation planning has not developed to more specific or implemental stages for many cities.

The last two types of plan are both explicitly focused on climate adaptation. The 'Dedicated Adaptation Framework for City' is a strategy that focuses exclusively on adaptation and vulnerability to climate change; however, it is more of an outline or framework provided for the city to continue developing action. Often, it will describe issues that will confront the city and imply how groups should coordinate, but not with a high degree of detail. Both Cape Town and Stockholm can be categorized as frameworks, as they take a general approach to adaptation planning and co-ordination. Finally, the 'Dedicated Adaptation Plan for City,' is the most devoted adaptation plan. It exclusively discusses adaptation concerns, and does so through explicit forms of action that can be taken by the city, by which groups, and over what period of time. London is the only plan that fits in this category. By overlaying these groups, we understand how most cities are presenting adaptation action, and to what degree it is integrated. This is an important method of comparison because there are no standard models for municipal level adaptation plans.

Overall, very few plans cross into the realm of specific impacts and options, as shown by the dashed horizontal line in Figure 3. Of the five cities with that level of

adaptation integration, only one is in the global south (Cape Town). Additionally, these plans were created at different times. The earliest, Cape Town, was created in 2006. Stockholm, Canberra and New York were published in 2007, and London was last, in 2008. There is no clear relationship between when a plan was created and where it is located on this chart. Three of these plans, Cape Town, Canberra, and Stockholm were generated through environmental ministries, while London and New York both came out of the city Mayor's office.

Chapter 5: Conceptualizing Climate Adaptation Action

As the subject of this study is adaptation, the remainder of this analysis focuses on unpacking the 15 plans that incorporate adaptation action. In this chapter, I will describe five criteria, and use them to conceptualize how cities are approaching climate adaptation. In this sense, 'conceptualizing climate adaptation' means using the actions and elements incorporated in these plans to define how cities are thinking about climate change adaptation. Based on this understanding, it is assumed that climate adaptation plans should include an assessment of resources and hazards, program objectives and implementation, methods to facilitate inter-organizational cooperation and coordination, community participation mechanisms, and sensitivity to equity issues. While the presence of these elements does not necessarily constitute a high quality plan, they demonstrate that planners and policy makers are conceptualizing climate change adaptation in a systematic, inclusionary manner. Within each of these five coding criteria, nested descriptions show how each of these criteria may be disaggregated into specific components. Tables 4-8 provide lists of the included plan items and their appropriate coding criteria.

The 15 action plans reviewed in this study are compared in relation to the Climatic Adaptation Coding Protocol in Table 3. Figure 3, the Spectrum of Adaptation Action, established that these plans are all at different levels of development. The ratings in Table 3 of low/moderate/high and strong/weak do not seek to evaluate the projected effectiveness of these plans, nor do they seek to define which plans are exhaustive in their content and development. Rather, these ratings identify the degree to which these plans

Table 3: Climatic Adaptation Dynamics

	Plan	Level of Assessment		Objectives and Implementation		Inter-organizational coordination		Citizen Engagement mechanisms	Concern for Equity Issues
		Resources	Hazards	Framing	Commitment to Implementation	Inter-agency	Inter-governmental		
Global South	Buenos Aires	Low	Moderate	Mitigation	Moderate	Weak	Weak	Weak	Weak
	Cape Town	High	High	Vulnerability	Moderate	Strong	Strong	Strong	Strong
	México City	Low	Moderate	Mitigation	Moderate	Strong	Weak	Weak	Weak
	Quito	Low	Low	Planning	Low	Strong	Strong	Strong	Weak
Global North	Canberra	High	High	Mitigation	Moderate	Strong	Strong	Strong	Weak
	Dublin	Low	Low	Mitigation	Moderate	Weak	Weak	Weak	Weak
	London	High	High	Development	Moderate	Strong	Strong	Weak	Strong
	Los Angeles	Low	Moderate	Mitigation	Moderate	Strong	Strong	Weak	Weak
	Madrid	Low	Moderate	Mitigation	High	Weak	Weak	Weak	Weak
	New York City	High	High	Planning	High	Weak	Strong	Strong	Weak
	Ottawa	Low	Low	Mitigation	Low	Strong	Strong	Strong	Weak
	Paris	Low	Low	Mitigation	Low	Weak	Weak	Weak	Weak
	Singapore	Low	Low	Mitigation	Low	Weak	Weak	Weak	Weak
	Stockholm	Moderate	Moderate	Development	Low	Weak	Weak	Weak	Weak
	Wellington	Low	Low	Mitigation	Low	Weak	Weak	Strong	Weak

have begun to incorporate the many facets present in climate planning, based on the five comparison criteria.

Level of Assessment: Conceptions of Vulnerability

Climate change will impact cities differently based on their capacity to deal with environmental, social, and economic stress. Communities endowed with financial capital, robust social networks, and plentiful natural resources will have more capacity to adapt to climate change than those communities without. Recognizing the resources available in a specific community as well as the hazards climate change brings against them is critical in understanding the vulnerability and resilience of communities (Moser 1998). Additionally, a comprehensive assessment of resource and hazards makes it easier to understand inequities that will be reinforced by climatic impacts such as diminished water resources or the resettlement of coastal communities (see the 'Concern for Equity Issues' section at the end of this chapter).

For the purposes of this study, the level of resource and hazard assessment by each group is classified in terms of low, moderate, or high. To receive a high rating in resource assessment, the city must incorporate social, economic, and ecological resources. In addition to this, there must be geographically specific information included, such as a map or written delineation of resource or hazard zones. The primary strength of local adaptation planning is that planners and policy makers are directly familiar with the local resources and capacities. Specificity in resource assessment demonstrates an awareness of and commitment to local concerns. For this study, hazard assessment is rated separately, but classified and presented in the same manner. The levels of assessment are also juxtaposed with the plan's objective framing. Objective framing is

defined as the general focus of the plans' objectives, and will be discussed in the following section.

Table 4: Coding Protocol – Specificity in the Assessment of Resources and Hazards

Ecological		Economic	Social
Climate projections	Potential invasive and exotic species	Economic capital	Social capital
Climate shocks	Wetlands mapped	Demand for hazardous land	Population growth
Rating of biodiversity	Surface hydrology	Road density	Health risks
Ecological capital	Water pollution	Air pollution	Carry capacity measurement
Habitat corridors	Loss of habitat	Wetlands development	Graphic representation of hazard zones
Vegetation classification	Graphic representation of conservation lands		Methods of land acquisition by state
Endangered species	Creation and maintenance of environmental databases		
Soil analysis			
Outline of present water resource			
Outline of potential water resources			
Climate Shocks			

Low Levels of Resource and Hazard Assessment

The majority of strategies reviewed received a low rating in resource assessment. In six cases, plans received low ratings in both resource and hazard assessment. All six of the climate strategies of these cities feature a mitigative framework, which means that the overall plan prioritizes efforts to mitigate climate change through the reduction of GHG emissions and energy use. Cities such as Dublin and Singapore exclusively explore mitigative action in their communities contain merely a gesture towards resource or hazard assessment in their communities. *The Draft Climate Change Strategy for Dublin City* (Dublin) includes a statement recognizing the need for adaptation, but this is not tied to the community's perception of resources. There is an only slightly better treatment of hazards in the Dublin plan, though the discussion is not geographically specific. As an

island community, *Singapore's National Climate Change Strategy* (Singapore) incorporates some flood risks in a geographically specific way concerning the protection of mangrove ecosystems.

Several of these plans have a slightly more developed stance on hazard assessment, though they do not yet arrive at a moderate mark. *The Climate Change Plan of Paris* (Paris) exhibits some concern for ecological hazards, in terms of flooding and heat wave, but does not explore the social or economic implication. *The Quito Strategy against Climate Change* (Quito), on the other hand, recognized that there will be social, economic and environmental risks, but is not explicit in how these risks may manifest in the municipality. The Quito plan calls for more studies on these impacts in the future. *The Ottawa Air Quality and Climate Management Plan* (Ottawa) receives low marks on the level of assessment of resources. It includes climatic projections, as well as discussions of biodiversity, invasive species risks, and changes is growing season. While concern for human health, infrastructure and air quality are of immediate concern in the Ottawa plan, there are no site specifics at the city scale. *The Wellington City Council Climate Change Action Plan* (Wellington) discusses physical and economic risks of climate change, but does not mention social risks. There is some geographic specificity, in regards to conservation areas, but again, this is primarily a mitigative plan, so it receives low marks in both categories.

Low Resource Assessment and Moderate Hazard Assessment

Similarly to Paris, Quito, Ottawa, and Wellington, several other cities assessed hazards more vigorously than resources. The plans for Buenos Aires, Los Angeles,

Madrid, and México City contained a low level of resource assessment coupled with a moderate level of hazard assessment. The objectives of these four plans were approached from a mitigative framework. Therefore, one can conclude that most mitigative plans will have a low to moderate assessment of resources and hazards. Similar to other low level assessment cities, these plans fail to assess the social and economic resources available in their community. *The Buenos Aires Strategic Plan* (Buenos Aires) does include limited geographic specificity and discusses how economic and social factors influence adaptation, but there is no discussion of this in the Buenos Aires context. The *Green LA Plan* (Los Angeles) considers water resources, alternative energy resources, economic resources that could be leveraged to produce capital for green businesses, but does not draw on social networks or discuss these assets with any degree of specificity. Both the *México City Climate Action Program* (México City) and the *Plan for Sustainable Energy Use and Prevention of Climate Change in Madrid* (Madrid) assess their respective biodiversity and water resources, ignoring social and economic resources. The México plan does suggest the presence of conservation areas in the southern areas of the Federal District.

In terms of hazard assessment, it is understandable that many city governments are more aware of the need to study the direct impacts of climate change. There is a direct relationship between mitigating climate change and the need to reduce what climate change will cause in a community. The Buenos Aires plan displays a specific understanding of natural hazards, as well as a general understanding that this will affect Buenos Aires industry and population. Similarly, the México City plan is concerned with climatic impacts, such as the effects of rain and ground instability on water resources and

urban ravines. The Los Angeles plan discusses the fragile environment, water scarcity, energy scarcity, and possible health risks, recognizing that health impacts will disproportionably affect the poor. Economically, the plan concludes that climate change will change the way that businesses operate in Los Angeles. While the Madrid plan discusses the impacts of climate change on human health, and damage to ecosystems, it does not discuss the economic implications of climate change. It does suggest more investigation in social and economic areas, but there isn't any at this time.

Moderate Level of Resource and Hazard Assessment

The only plan in this study to receive moderate marks on both the assessment of resources and hazards was *Stockholm's Action Programme on Climate Change* (Stockholm). More of a planning assessment document, this plan lays out how climate change will impact Stockholm. It includes climate projections, and discussion of the possible effects on biodiversity. It addresses the potential effects on the tourism industry in Stockholm, as an economical aspect. However, the discussion of the social hazards and resources in the Stockholm plan is limited to mostly biophysical flooding concerns.

High Level of Resource and Hazard Assessment

There were four plans in this study that exhibited a high level of resource and hazard assessment, taking into account social, economic and ecological concerns. As local strategies, the most important strength of these plans is the presence of specific geographic details in relation to regional resource and hazard assessments. The

Australian Capital Territory Climate Change Strategy (Canberra) clearly defines natural resources, and how Canberra is vulnerable to climate change in a specific way. While it is still couched in a mitigative framework, the plan contains items calling for economic and social vulnerability assessments. *PlaNYC* of New York City incorporates site-specific climate projections and discusses the resilience of climate change on New York City's social networks and economy, and much like Stockholm and Quito, the document is framed by planning issues.

The Framework for Adaptation to Climate Change in the City of Cape Town (Cape Town) is the only plan in is study that approaches climate adaptation through a lens of vulnerability. There is a clear discussion of the need for ecological, economic and social analyses. The plan incorporates clear descriptions of vulnerable areas based on previous floods and climate shocks, including the area of the Cape Flats, which is comprised of informal settlements. *The London Climate Change Adaptation Strategy* (London) approaches adaptation through a lens of overall development. It includes a very clear discussion of social, economic and ecological strengths.

Objectives and Implementation

There are also two areas of focus under the objective and implementation category, objective framing and the plans commitment to implementation. Both of these elements assess the goals and mechanisms that frame the climate action strategies and programs.

Table 5: Coding Protocol - Objectives and Implementation

How are objectives framed?	Commitment to Implementation
Vulnerability Mitigation Planning Development	Identification of costs/ budget Identification of funding sources Identification of responsible parties Goals are clearly specified Clear timetable for implementation Evaluation mechanism Presence of measurable objective Phasing of projects Plan responsive to future changes Options for reaching objectives Analysis of options Clear program boundary

Objective Framing

Objective framing is defined as the general lens of presentation and creation of a plan's objectives. In other words, climate adaptation will be achieved by focusing on 'X,' with the 'X' representing the objective framing. Since this study included any climate change action plan as a possible case study, objectives could be framed through mitigation, vulnerability, development, or planning.

A mitigative framework is one that emphasizes the reduction of GHG emissions and energy consumption through means of technological innovation and behavioral change. Mitigation in this sense is not synonymous with the mitigation plan type used in Figure 3. Instead, the mitigation framework can apply to any 'type' or plan, and only indicates that it is primarily concerned with GHG reduction. Madrid and Wellington are plans explicitly set in place in an effort to promote carbon neutrality, improvements of air quality, and reduction of energy consumption. Dublin, Los Angeles, Paris, and Singapore are all marketed as general climate change strategies, but their focus is still on the mitigative aspect of climate change. Ottawa is another plan marketed through carbon

neutrality, but there are explicit plan items calling for adaptation action. The Canberra and México City plans are promoted as overall climate action plans, but feature limited adaptation efforts. While the México City plan's objectives deal with vulnerability issues, they are done through reducing GHG emissions. The Buenos Aires plan is a general strategic development strategy, but climatic action is heavily mitigative.

An objective framework of vulnerability is defined by understanding the specific ways that existing social, economic, and ecological weakness will be intensified through climate change. A vulnerability framework recognizes the need to compensate for inherent inequities in community resilience. Cape Town was the only city that viewed climate change adaptation through a lens of vulnerability.

An objective framework of development signifies that the plan primarily incorporates climate change into overall development of the city. Effort may be focused at diverting construction and land development into less flood-prone areas, economic investment in alternative energy sources, or any other efforts that seek to reinforce the adaptation agenda by incorporating it into overall growth and development. Alternatively, development may also be defined in the global south by tying adaptation into the Millennium Development Goals (MDGs). London viewed climate change adaptation through a lens of overall development, as it focused on how to guide economic and physical development away from hazard zones. Stockholm also used a development framework, in that it is very systematic in its concerns and reflects on how changes will create new development patterns.

An objective framework of planning is defined by a plan that focuses on strengthening the capacity and coordination capability of people and institutions. It

focuses on integrative development of climate action, and ideologically compliments the development framework. New York is a planning oriented framework, predominantly because climate change action is one element in a general development plan, and seeks to facilitate coordination between agencies. Quito also has a planning framework, as its primary goal is to coordinate of climate action by other groups, rather than initiating climate action on its own.

Commitment to Implementation

Commitment to implementation is an approximation for how thorough a plan is in identifying logistical details important for implementation. This is categorized in terms of low, moderate, and high. A plan would receive a high rating in commitment to implementation if it included the following six elements: a budget or cost outline, identification of funding sources, identification of parties responsible for planning actions, clear goals, a clear implementation timeline, and an evaluation mechanism. The inclusion of three to five of these elements would earn a moderate rating, while the inclusion of two or less would earn a low. While it is understood that each city is at a different stage of developing its climate action framework, the inclusion of these elements shows a general commitment to apply action elements. Of all of the comparison criteria, this category featured the fewest plans with a "high rating," implying that few plans are incorporating logistical implementation elements into their climate action planning at this point in time.

Six out of the 15 adaptation plans reviewed were assigned a low level of commitment to implementation. One of the least developed plans is the Stockholm

strategy. This plan is very basic, and merely explains how Stockholm will be impacted by climate change. Cost will be estimated in a later stage. There is an implication that the program will be organized in short and long-term projects. The Buenos Aires plan is also relatively undeveloped. This plan features clear graphics including information regarding project phasing, timetables, but no discussion of budget, funding or program responsibilities.

Of the plans with a low level of commitment to implementation, most include a clear goal or project boundary, while lacking in cost, funding or evaluation elements. The Paris plan does not demonstrate a designation of cost, funding or a timeline. The Singapore plan includes a discussion of cost and funding in reference to technological and mitigative efforts, but nothing in terms of adaptation action. The Wellington plan states that national government as well as city council funding may be available for some initiatives. Wellington City Council is also exploring alternative funding sources such as EECA energy efficiency loans. However, there are no cost or budget features, nor a clear timeline for implementation of projects. The Ottawa plan includes that funding is available from the federation of Canadian municipalities and federal funding programs, but this is a noncommittal statement. There are three phases of this plan, which span a twenty-year period, ending in 2014. The phases are (1) planning and monitoring of priority actions, (2) implementation of management strategies and refinement of plan, and finally (3) the evaluation of management measures. Phases 1 and 2 are already underway. Adaptation is a Phase 2 activity in the Ottawa plan.

Of the plans reviewed, seven featured a moderate commitment to implementation. The Canberra plan received a moderate rating because it clearly identifies costs in some

program areas, clearly specifies goals, shows a manner of project phasing, has a clear timeline for implementation, and incorporates an evaluation mechanism. The Cape Town framework demonstrates program phasing, plan responsiveness to future changes, and clear specification of goals. The Dublin plan receives a moderate rating on commitment to implementation because it has clear targets, a timeline for achieving these objectives, and some evaluation mechanisms. The London plan identifies responsible parties, incorporates evaluation mechanisms, and has clearly defined goals. The Los Angeles strategy discusses implementation in a section of the plan, and in which mechanisms the city can use its direct authority to undertake these initiatives. There are deadlines in place for several groups to make and prioritize plans of action and clear goals. The México City plan includes clearly specified goals, short and long term phasing, cost estimates, and suggests that the Federal District (DF) has funding to undertake some programming. The Quito strategy is split into three implementation phases: (1) planning and political decision-making, (2) advisement and execution, and (3) coordination, communication, and public relations. Annual action plans created for the Quito plan will include measurable objectives for concrete actions, the parties responsible for these activities, a timeline for execution, an outline of necessary resources, financial proposals and sources, and indicators of completion and evaluation. As a planning framework plan, there are also many efforts at strengthening the capacity of government to integrate and enforce action. The Quito plan features objectives to create a budget, timeline, and identify funding sources in the future.

Of the plans reviewed, only two featured a high level of commitment to implementation. In addition to clearly defined goals, the Madrid plan features a section

detailing estimated costs, responsible parties, and timelines for by adaptive activities. The New York City strategy identifies cost, possible funding sources, responsible agencies, clear goals, and features a timetable for completion of milestones. The plan also appears responsive to future changes in climate projections.

Inter-organizational Coordination

Under the criteria of inter-organizational coordination, there are two categories considered: inter-agency coordination and inter-governmental coordination. Inter-agency coordination can apply to private and nongovernmental organizations (NGO) interacting with each other or with government agencies. Inter-governmental coordination, on the other hand, includes all forms of nested government cooperation (such as city government working with state government) and also parallel government cooperation (two city governments working together). Within these categories, each is rated as either strong or weak. A strong rating is earned when the plan exhibits six or more of the possible signs of inter-organizational coordination, with at least one form of coordination from each of the following: government, NGOs, and private sector. A weak rating is assigned to any plan which includes five or less of the possible signs of inter-organizational coordination and excludes government, NGOs, or the private sector.

Table 6: Coding Protocol - Inter-organizational Coordination

Working with NGOs	Joint database production
Inter-agency cooperation within city government	Links between science and policy specified
Cooperation with other organizations/jurisdictions specified	Commitment of financial resources
Coordination within jurisdiction specified	Involvement in international carbon trading
Coordination with private sector	Designation of responsibility
Information sharing	Recognition of other cities' "Best Practices"
Other organizations/stakeholders identified	Feedback mechanisms
Research and academic institutions	Discussion of institutional capacities
Inter-governmental Bodied specified	

Weak Inter-organizational Coordination

Of the plans reviewed, seven out of 15 exhibited weak coordination between government agencies, NGOs, and private firms. Six of these plans also exhibited weak coordination between governments. In terms of both inter-agency and intergovernmental coordination, Dublin, Madrid, Paris, Singapore, Stockholm, and Wellington are rated weak. Some of these plans do not mention issues of cooperation or multilevel governance mechanisms. However, the majority of these plans mention agency cooperation, but are not explicit in how these groups interact.

The Dublin plan discusses participating in European-wide programs such as ROSH and ASTUTE, but there is limited coordination concern. The Madrid plan shows a clear designation of responsibility within and between government organizations, but there is little clarity of the role of business and NGOs in Madrid climate adaptation. There is a section in the Madrid plan which calls for the Local Energy Agency to engage store owners, industry, business associations, ecological groups, civic organizations in climate efforts, but it seems very one sided and focused mainly on awareness.

Coordination between organizations is low in the Paris plan, though there is some activity listed both domestically and internationally. The Paris plan works in cooperation

with the *Prefecture's Plan for Reducing flood risks* (PPRI) to reduce the effects of floods on electricity distribution. There is also weak inter-governmental coordination, despite the creation of an inter-agency taskforce led by the Ministry of National Development and discussion of participating in Clean Development Mechanism projects (CDM) in other countries. The Paris program is currently earning carbon credits by planting trees in developing countries such as Haiti, Madagascar and Cameroon. The Singapore plan does not include coordination with NGOs, though some cooperation is taking place with business and research facilities in terms of research and development.

The Stockholm plan, references affiliation with many national and international networks. The plan is affiliated with ICLEI and CCP, but incorporates limited discussion of government interaction, thereby earning weak scores in both of these areas. Finally, Wellington is weak on interagency cooperation, despite being affiliated with ICLEI, the national government, and several research universities.

Mixed Levels of Inter-organizational Coordination

Of the plans reviewed, New York City, México City, and Buenos Aires were the only three plans that were inconsistent in their levels of inter-organizational coordination. The New York City plan is weak in inter-agency coordination, while strong in inter-governmental coordination. In terms of inter-agency coordination, the New York City plan works with private companies, such as electricity provider ConEd, and regional carbon cap and trade schemes. However, there is an overall lack of NGO cooperation or network affiliation. While there is limited research with universities or other research institutions, the New York City plan cooperates with the Columbia University Center for

Climate Systems Research. In contrast to inter-agency cooperation, inter-governmental coordination is strong in the New York City plan. There is extensive coordination between state, city, and community level planning, and an appearance that the plans at different levels of government will work together. There is information sharing between groups, as well as recognition of other cities best practices in the case of cycling in Chicago and congestion pricing in London. Finally, the New York plan outlines the commitment of financial resources available from different levels of government.

The México City and Buenos Aires plans also received mixed ratings on inter-organizational coordination. Unlike New York, the México and Buenos Aires plans were strong in inter-agency coordination, while weak in inter-governmental coordination. The México City strategy received a strong rating on inter-agency coordination due to the high degree of NGOs, educational, research facilities incorporated in the planning process for information sharing. In addition to this, there are several lateral agencies within the DF government working on this plan, and responsible for different aspects. There is the incorporation of lateral planning initiatives in the metropolitan climate action framework. In inter-governmental coordination, the México plan received a weak rating, because there is not explicit coordination on the national level, with regards to the climate change planning processes. However, there was some coordination with other state and city level actors in the metropolitan zone of the valley of México (ZMVM), such as the Inter-Ministerial Commission on Climate Change (ICCC). In terms of interagency coordination, the Buenos Aires plan earns a strong rating for its extensive cooperation with international NGO initiatives, such as the ICLEI-CCP Campaign, the CCI, and the

C40, as well as links between science and policy, and cooperation with other agencies in Buenos Aires.

Strong Inter-organizational Coordination

The remaining six plans display a strong degree of both inter-agency and inter-governmental coordination. The plans included in this category are Canberra, Cape Town, London, Los Angeles, Ottawa, and Quito. In the Canberra plan, there are several cooperative efforts taking place between national, state, and local council governments. There are also efforts to incorporate the private sector in adaptive efforts, and information sharing between agencies. In both aspects of inter-organizational coordination, the Cape Town plan receives high marks, based on its emphasis on the importance of multilevel governance. There is coordination and information sharing between government, research institutions, and NGOs and the private sector under this plan. Additionally, there is some discussion of institutional capacities and clear links between science and policy and joint data-base production. In inter-agency coordination, the London officials are working with private companies (Thames Water; Three Regions Climate Change Group) and research institutions (UK climate impacts program; London Resilience Partnership; Hadley centre for climate protection and research at the meteorological office; Engineering and Physical Science Research Council) to share information and create joint-databases. The London plan also coordinates with many government groups as well, including borough governments through the Local Government Performance Framework, London Resilience Partnership, London Emergency Services Liaison Panel

(LESLP), Regional Civil Contingencies Committee, Secretary of State for the Environment, and Food and Rural Affairs.

In the Los Angeles plan, inter-organizational coordination receives a strong rating as it seeks to incorporate industry, NGOs and different government agencies into planning. The Los Angeles office is working with international NGOs and organizations such as C40, CCI, and the U.S. Conference of Mayors. They are also working with the ports and private businesses to encourage all groups to create their own plans. Inter-governmentally, the Los Angeles plan is also strong, as it participates in state targets and plans such as the AB 32 – Global Warming Solutions Act, Southern Coast Air Quality Management District, Regional Water Quality Control Board, Los Angeles Unified School District, County of Los Angeles, Southern California Association of Governments, Metropolitan Water District, Sister Cities. The climate action plan also complement many plans that are already underway in terms of development and environmental initiatives.

The Ottawa plan also receives strong marks in terms of inter-organizational coordination. Environmental groups, private service providers, and the Emergency Management Unit of the city are also involved in the Ottawa plan. There is some government coordination in the form of the city of Ottawa and the regional municipality of Ottawa-Carleton, Meteorological Service of Canada (MSC), the neighboring city of Gatineau, the provinces of Ontario and Quebec, federal departments of environment, natural resources, and health, and the plan factors in actions underway at all levels of government. There is also a reference to some best practices, such as the Toronto Heat Watch Warning System.

Finally, in Quito, there is the creation of an inter-institution technical group responsible for policy creation and resource prioritization and research. The Quito plan outlines efforts to strengthen the coordination capacity and the cooperation, and suggests the incorporation of metropolitan boards, businesses, and corporations as technical advisors. Quito is also affiliated with ICLEI. Inter-governmental coordination is aided by cooperation with the National Climate Committee of Ecuador that is working with the UNDP to create new climate plans across the country.

Citizen Engagement Mechanisms

For the purposes of this study, citizen engagement mechanisms are also rated using strong and weak designations. A strong rating in this case is earned by the identification of stakeholders, the inclusion of communities in planning processes, capacity building, and the development public education programs. If the plan does not include at least one example of each of these, it earns a weak rating.

Table 7: Coding Protocol - Levels of Citizen Engagement

Identification of stakeholders	Capacity building activities for community groups
Stage of community outreach	Public Availability of Resources
Public education programs	Public Feedback or Evaluation Mechanism
Community feedback	

Weak Efforts at Citizen Engagement

Overall, nine of the 15 plans reviewed earned weak designations. These plans include Buenos Aires, Dublin, London, Los Angeles, Madrid, México City, Paris, Singapore, and Stockholm. Of these plans, neither Buenos Aires nor Stockholm feature

any educational or participative actions planned. However, the Buenos Aires plan aims to develop more adaptive measures in the future. The remaining plans in this list all incorporate education or public awareness campaigns, but do not incorporate the citizenry in decision-making. The Madrid plan incorporates a general awareness campaign. The Dublin plan mentions education campaigns and alludes to stakeholder involvement, but these are not well defined. The Los Angeles strategy calls for community engagement in the form of multilingual education in communities on environmental justice challenges and working with community groups to develop green jobs programs, but it does not seem to allow feedback on the plan itself as is found in some other cities. There is not a clear identification of stakeholders and the public education seems amorphous. The Paris plan is creating an education campaign focused to teach students about the effects of climate change, but community groups do not seem involved in these planning processes. The Singapore plan created the Climate Change Awareness Programme (CCAP) to raise public awareness on climate change issues. Finally, the México City plan creates an awareness campaign in addition to having public workshops at the beginning of the plan development process.

Strong Efforts at Citizen Engagement

Six of the 15 plans reviewed earned strong marks in the realm of community participation. These plans include Canberra, Cape Town, New York City, Ottawa, Quito, and Wellington. The Canberra plan incorporates many methods of community participation. There is both stakeholder outreach and participation in the planning processes. There are public education campaigns, and also capacity building for

community groups. The Cape Town plan is similarly engaged, featuring many citizen engagement mechanisms including the identification of possible stakeholders, outreach efforts, awareness campaigns, and stakeholder consulting and assessments. The London plan is also strong in citizen engagement, with the most singular aspect being the list of questions concluding each chapter of the adaptation plan. There was a clear date up to which the Mayor's office welcomed feedback on these questions for the development of future planning efforts.

The New York City plan is very explicit in how it is engaging the public. The city is working on site-specific adaptation plans with stakeholder groups through a community planning process. They are starting with two case studies in vulnerable waterfront communities, and engaging all stakeholders because they recognize that risk and ideal solutions will vary based on location and resources available. They are working with Columbia University, UPROSE and Sunset Park to "create a process for engaging waterfront neighborhoods in conversations about climate change adaptation" (City of New York 2008). The project goal was to have a standardized process by 2008, based on the Sunset Park community, and to use this template in all other waterfront communities. The Ottawa plan also aims to identify agency and community stakeholders for climate change action. There is a education program, started in 2004, to encourage behavioral changes, so that, "communit(ies can) form their own educated opinions and act upon them" (City of Ottawa 2004). This plan also recognizes Ottawa as a multicultural city, which creates the need for working with public focus groups, public workshops, meetings with stakeholder groups.

Compared to New York and Ottawa, the Quito plan is less active in stakeholder identification, but citizens are encouraged to contribute to the development of the program. The primary thrust of the Quito plan is to strengthen community capacity so that groups may actively participate in solving the climate problem. There are also initiatives for zonal administrations and metropolitan territory councils to participate in the environmental councils concerning risk management and sustainable development. In public education, the Quito plan establishes permanent campaigns to provide information to the citizenry concerning sustainable resource practices, administrative zone workshops, workshops for neighborhoods, schools and universities. Similarly, the Wellington plan is working to increase the capacity of environmental community groups and create social marketing tools to raise awareness. Despite recognizing the difficulty changing behavior through of education, the Wellington City Council is planning community awareness campaigns.

Concern for Equity Issues

Finally, equity issues are also discussed in terms of strong and weak. A strong rating is earned when the plan defines vulnerable populations (in terms of natural resources and livelihood), recognizes the importance of maintaining social networks, and considers the need for conflict resolution mechanisms. While there are other equity elements that may be present in a plan, these are critical and must be present to earn a strong rating.

Table 8: Coding Protocol - Sensitivity to Equity Issues

Definition of vulnerable groups	Discussion of slums and informal settlements
Social vulnerability assessment	Sensitive to issues of resettlement
Economic vulnerability assessment	Conflict resolution mechanisms
Identification of communities within hazard zones	Importance of maintaining social capital
Poverty mapping	Cultural sensitivity
Adaptation to previous climate variability	Ongoing development activities

Weak Recognition of Equity Issues

Despite many scholars insisting that reducing vulnerability of human settlements to climate change impacts is vital, 13 of the 15 plans reviewed received weak ratings on equity issues. These plans include Buenos Aires, México City, Quito, Canberra, Dublin, Los Angeles, Madrid, New York City, Ottawa, Paris, Singapore, Stockholm, and Wellington. Of these plans, Buenos Aires, Dublin, Los Angeles, Singapore, Stockholm, and Wellington do not discuss equity or differential vulnerabilities at all. Many of these plans (all but Stockholm) feature mitigative frameworks, and are also weak in the categories of resource and hazard assessment. While the Ottawa and Quito plans recognize that there are more vulnerable populations, they do not identify these communities by location, name, or their specific vulnerabilities.

While there is recognition of equity issues, the Canberra plan is weak in reacting to them. There is a social impact analysis under the Community Inclusion Board to study the effects of climate change on low income, disadvantages, and vulnerable residents. However, there are no efforts to incorporate conflict resolution or to clearly define which groups are vulnerable or disadvantaged. The Madrid plan also receives weak marks on visibility of equity issues. The plan defines vulnerable population as the elderly, in reference to the health risks of climate change. There is no discussion of the spatial relationship of the urban poor to hazardous zones in the Madrid plan.

In the México City plan, there is recognition that climate change will exacerbate social and economic inequalities, but no real discussion of which groups are considered vulnerable or how this plan will help to reduce this inequity. The urban poor are referenced in regards to living near urban ravines, but we are not made aware of the level of vulnerability or nature of these settlements. The Paris plan defines vulnerable populations as children, the elderly, the handicapped, and those working exposed to weather conditions. To protect these groups, there are suggestions to create a heat wave vulnerable registry, known as CHALEX, and to change the labor code to forbid working during extreme temperatures.

Finally the New York City plan recognizes that different communities will have different risks to property and livelihood, but they do not begin to talk about the social and economic implications of this, or discuss the distribution of the poor among hazards zones. The plan defines vulnerable as communities near the coast and elderly. The plan aims to work with vulnerable communities to develop site specific, but the only description of vulnerable are those communities located on the waterfront. Oddly, the New York strategy calls for 900,000 more residents relocating into the city by 2030 as an effort to reduce carbon output in the suburbs. While interesting, this strategy does not seem to comply with the issue of reducing settlements in danger zones for long term planning.

Strong Recognition of Equity Issues

Ultimately, there are two plans that feature a strong recognition of the inequities strengthened by climate change. The Cape Town and London plans feature the highest

level of sensitivity to the inequities of climate impacts of the 15 plans studied. The Cape Town plan defines vulnerable populations in many different ways, from those with economic hardships to those infected with HIV or with other health risks. The plan features sensitivity to resettlement issues as well as identification of communities within hazard zones. There is also discussion of the informal settlements located in the Cape Flats, a flood prone area.

The London plan recognizes that overheating and new water metering methods may increase the social inequities among vulnerable groups. The plan dissects the concept of vulnerability, splitting it into personal and situational vulnerability. Personal vulnerability would include an individuals' age, disability, language barriers, or poor health. Situational vulnerability would be defined as low income, lack of insurance or social support network, and living in a flood plain (City of London 2008). Combinations of personal and situation vulnerabilities are highlighted in the ten gypsy camps located in flood zones and other low-income residence living in flood plains without insurance. On an emotional level, the London plan also recognizes that intangible impacts such as depression and anxiety are ultimately worse and longer lasting than tangible impacts (lost possessions) of flooding (City of London 2008). This is the only plan that considers this dichotomy.

Chapter 6: A Holistic View of Climate Adaptation

The preceding chapters have described how 15 global cities are approaching climate change adaptation by unpacking and comparing adaptation planning elements. This chapter recombines these elements to understand overall trends in adaptation planning at the city scale.

What do current adaptation efforts look like?

It is clear through this analysis that municipalities are developing adaptation plans in a variety of ways. The majority of municipal adaptation plans available continue to frame climate efforts through carbon mitigation (ten out of 15). Despite being framed as opposites, adaptation fails to stand independently of emission and energy concerns. Overall, cities are poorly assessing their resources and hazards, though the level of hazard assessments is more evening distributed. In the global south, plans were more likely to assess hazards at a moderate level. Most of these hazard assessments are in the form of biophysical concerns. Failing to assess resources and hazards through the socio-economic lens makes it difficult to gage the differential vulnerability of groups, and leaves adaptation dependent on uncertain scientific analyses.

Adaptation planning is not uniformly including implementation elements such as budgets or evaluation mechanisms. This may reflect the stage of adaptation planning, or a lack of oversight. Southern plans do reflect a higher integration of implementation planning, when compared to northern plans. There are no clear trends in inter-organizational coordination, as there are as many weak plans as there are strong ones.

However, there is a slight tendency towards more inter-agency involvement in developing cities, possibly reflecting decentralization of power and interests. Plans are not including mechanisms for citizen engagement or equity. This implies a very top-down approach to adaptation in global cities. Southern cities are slightly stronger in these areas, but lack of inclusion may be a weakness of large city planning in this case.

Who is Planning for Adaptation?

Based on these trends, there are no clear delineations as to who is planning for adaptation at the municipal level. Despite the UNFCCC and adaptation literature emphasizing the importance of adaptation in the global south and mitigation in the global north, this is not happening. Of all the world capitals and megacities, only four southern cities are currently thinking about adaptation. Both Buenos Aires and México City frame their adaptation in mitigation frameworks. Like Quito, several of these southern cities are choosing to action on mitigation in order to support their other climate change agendas. Of the southern cities reviewed, the Cape Town Framework is the only one that focuses exclusively on vulnerability and adaptation.

Similarly, the presence of a climate change strategy or mitigation strategy does not imply the presences of adaptation in these cities. Many of the plans advertised as general climate strategies are still predominantly angled towards mitigation, as seen by the cluster of these strategies located in the lower portion of Figure 3. These plans have made statements of intent (Dublin, Quito, Ottawa, Madrid, Wellington, México, Los Angeles, Paris), and three have started local analyses (México, Los Angeles, Paris), but none of these plans have explored options for local adaptation action.

Even cities that may have seen early success in climate mitigation cannot be assumed to be moving forward on adaptation issues. This may be related to the assumption that adaptation action signifies 'giving up' on mitigation, or it may be related to a general lack of capacity. While México City has seen much success in recent years in relation to the reduction of GHGs, it is unclear how much of their climate adaptation plan will be executable, without secured funding. Satterthwaite, Huq and Pelling stated in 2007, "Since 2000, authorities in Mexico City have related climate change to air pollution and developed an integrated understanding of synergies between mitigation and pollution control. But little attention has been given to enhancing Mexico City's adaptation to floods, heat stress, water scarcity, and other hazards likely to be aggravated by climate change. Furthermore, city authorities lack the institutional capacity (e.g. human resources, money and power) to deal with climate-related hazards" (Satterthwaite 2007). It is clear that coordination, resources and political will remain obstacles in climate change adaptation in the metropolitan region of México City, and this may be prevalent in other cities.

One trend in adaptation planning is found between the size of a city and the type of plan they create. All of the megacities plans are either strictly mitigative, general development plans, or general climate change strategies. There are two in each category, but megacities are not approaching adaptation on its own. This implies that megacities considering adaptation are only doing so within a broader framework, such as development in the case of Buenos Aires. New York is the only megacity that is implementing elements of adaptation action. It will be interesting in the future to compare

this more integrative approach to cities such as London that have adaptation-specific plans.

Unlike megacities, there is no apparent relationship between plan type and the size or location of capital cities. While most of the plans reviewed were for capital cities, none of the plans cited the presence of local government institutions and infrastructure as impetus for adaptation planning. However, many of these plans do use government buildings, vehicles, and processes to set an example in adaptation and mitigation action. Many of these cities, such as México and Quito, are initiating building retrofits or capacity building in government as their primary thrust into climate action. Other cities such as Stockholm are taking care to limit development, primarily public buildings, in hazard zones.

While limited connections may be drawn between the type of organization creating climate adaptation plans and the focus of these plans, there are no overarching links in sample. This may be due to the differences in institutional structure or because, climate adaptation is an emerging field. As we move forward, it will be interesting to see how the institutional linkages within communities and on the global stage influence adaptation efforts.

Why are communities planning for adaptation?

Adaptation, as it is commonly understood, is a reaction to perceived vulnerability. Therefore, it would make sense that locally created adaptation plans would react to the perceived vulnerabilities in a specific locale. Surprisingly, these strategies are not approaching adaptation and resilience planning through a lens of vulnerability, nor are

they focusing on the strengths and weaknesses that are available locally. While four plans (Buenos Aires, México City, Los Angeles, and Madrid) did assess hazards more effectively than assets, they still performed poorly in all areas of assessment.

Only the Cape Town strategy was framed through a lens of vulnerability. While other cities did discuss hazards, they were not guiding adaptation through prioritization of vulnerability, fail to recognize that vulnerability is distributed inequitably, or have a very narrow definition of vulnerability. More often than not, the plans studied seemed to follow a script rather than focus on local issues. Given the regional and cultural difference between these sites, it seems that climate action has become a, "worldwide model constructed and propagated through global cultural and associational processes" (Meyer, Boli et al. 1997). The majority of these plans, such as those cities clustered in Figure 3 around 'Statement of Intent' and 'Adaptation Element with Climate Change Strategy,' make the same pro forma assumptions on local climate impacts, without engaging local ecological or social concerns. Whether it is because of the uncertainty of local climate impacts, or the lack of a city-scaled adaptation framework to follow, city planners are not learning how their localities should prepare to adapt through the international networks currently available. Many of these networks were established for the purpose of mitigating climate change, and have been slow to incorporate adaptation as a uniform goal.

Many of the inherent methods used in information sharing are not apparent when comparing these 15 plans. Chronological distribution does not account for the varying levels of adaptation development. Regional clusters do not dictate level or presentation of plan, nor does level of overall economic development. Very few cities discuss 'best

practices' of other cities, and many plans pitch their climate adaptation as "trailblazing" or "setting an example." Despite planners thinking of their adaptation strategy as trendsetting, the plans demonstrate a high rate of isomorphism, as they quote the same IPCC reports about global climate change. According to Meyer, when policymakers are confronted with difficulty in formal structuration, they, "may settle for incorporating the required principle in general statements of values," as a way to demonstrate "rationalized progress" (Meyer, Boli et al. 1997). As seen in Figure 3, at least six of the plans reviewed appear to have adopted this strategy. Many times, this copying of external logic creates inconsistencies between values and action, setting goals that, "states cannot live up to," (Meyer, Boli et al. 1997). As adaptation action and policy are relatively new fields, this trend is unsettling and discouraging.

Moving Forward

Resilience, as we understand it, is about using what you know to create opportunities for flexibility, collaboration, and foresight. Using these values as goals, policymakers need to stop prioritizing mitigation, waiting for scientific certainty, and depending on global networks to design programs that will be implemented at the municipal level. The current climate change networks are still depending on mitigative methods to battle climate change, and lack innovation. Rather than using normative isomorphism in an attempt to appear more legitimate, planners as well as individuals should focus on the their local resources and hazards – social, ecological and economic- to proactively plan for climate adaptation (DiMaggio 1991). Much like local economic development, understanding of local knowledge is critical before the current networks

may be used as tools, rather than barriers, to overcome the unexpected. Building capacity and cooperation will benefit cities not only in adaptation planning, but also in the achievement of broader development goals.

References

Adger, N., S. Huq, K. Brown, D. Conway and M. Hulme (2003). "Adaptation to Climate Change in the Developing World." Progress in Development Studies **3**(3): 179-195.

Aguilar, A. G. (2004). Los asentamientos humanos y el cambio climático global. Cambio Climático: Una Vision desde México. E. Julia Martinez, Patricia Osnaya, Adrián Fernández Bremauntz. México, D.F., Instituto Nacional de Ecología**:** 267-278.

Australian Bureau of Statistics. (2006). "2006 Census Data by Location." 2009, from http://www.censusdata.abs.gov.au/ABSNavigation/prenav/ProductSelect?subaction=1&areacode=805&action=201&collection=Census&textversion=false&breadcrumb=L&period=2006&javascript=true&navmapdisplayed=true&.

Australian Capital Territory (2007). Weathering the Change: The Australian Capital Territory Climate Change Strategy - Action Plan 1. Sustainability Policy and Programs. Canberra.

Burton, I., S. Huq, B. Lim, O. Pilifosova and E. L. Schipper (2009). From Impacts Assessment to Adaptation Priorities: The Shaping of Adaptation Policy. The Earthscan Reader on Adaptation to Climate Change. I. B. E. Lisa Schipper. London, Earthscan**:** 377-393.

City Mayors Statistics. (2007). "The largest cities in the world by land area, population and density." 2009, from http://www.citymayors.com/statistics/largest-cities-2007.html.

City of Bangkok (2007). Action Plan on Global Warming Mitigation 2007-2012. Bangkok Metropolitan Administration. Bangkok.

City of Buenos Aires (2008). Plan Estratégico 2008 -2012. Agencia de Protección Ambiental de la Ciudad Autónoma de Buenos Aires. Buenos Aires.

City of Cape Town (2006). Framework for Adaptation to Climate Change in the City of Cape Town (FAC4T). City of Cape Town: Environment Resource Management. Cape Town, SA, University of Cape Town.

City of Dublin (2008). Draft Climate Change Strategy for Dublin City. Dublin City Council. Dublin.

City of London (2008). The London Climate Change Adaptation Strategy. Mayor of London. London.

City of Los Angeles (2007). Green LA: An action plan to lead the nation in fighting global warming. Mayors Office. Los Angeles.

City of Madrid (2008). Plan de uso sostenible de la energía y prevención del cambio climático de la ciudad de Madrid. Area de gobierno de medio ambiente. Madrid.

City of México (Districto Federal) (2008). Programa de Accion Climatica de la Ciudad de México 2008-2012. México City, Districto Federal, City of México.

City of New York (2008). PlaNYC: Climate change. New York, New York Mayors Office.

City of Ottawa (2004). Ottawa 2020: Air Quality and Climate Change Management Plan. Planning and Growth Management. Ottawa.

City of Paris (2007). Plan Climat de Paris. Mairie de Paris. Paris.

City of Quito (2008). Estrategia Quiteña ante el cambio climatico. Dirreccion metropolitana ambiental. Quito, Municipio del Districto Metropolitano de Quito.
City of Stockholm (2007). Adapting to Climate Change in Stockholm. Stockholm's Action Programme on Climate Change. Stockholm.
City of Tokyo (2007). Tokyo Climate Change Strategy: A basic policy for the 10-year project for a Carbon-minus Tokyo. Tokyo Metropolitan Government. Tokyo.
City of Wellington (2007). Wellington City Council Climate Change Action Plan: Creating a Carbon Neutral Council and Community. Wellington City Council. Wellington.
Consejo Nacional de Población. (2008). "Proyecciones de la Población de México 2005-2050." 2008, from http://www.conapo.gob.mx/00cifras/5.htm.
DiMaggio, P. J., and Walter W. Powell (1991). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organization Fields. The New Institutionalism in Organizational Analysis. W. W. P. a. P. J. DiMaggio. Chicago, University of Chicago Press: 63-82.
DiMento, J. and P. Doughman (2007). Climate Change: How the World is Responding. Climate Change: What it means for us, our children, and our grandchildren. Cambridge, MIT Press: 101-138.
Dublin Chamber of Commerce. (2009). "Dublin Profile." 2009, from http://www.dublinchamber.ie/economy.asp.
El Instituto Nacional de Estadística. (2008). "Población a 1 de enero de 2008 ", 2009, from http://www.ine.es/jaxi/menu.do?type=pcaxis&path=%2Ft20%2Fe260&file=inebase&L=# ^ INE (2008).
Handmer, J. and S. Dovers (2009). A Typology of Resilience: Rethinking Institutions for Sustainable Development. The Earthscan Reader on Adaptation to Climate Change. I. B. E. Lisa Schipper. London, Earthscan: 187-210.
Huq, S., S. Kovats, H. Reid, D. Satterthwaite (2007). "Editorial: Reducing risks to cities from disasters and climate change." Environment and Urbanization **19**(1): 3-15.
ICLEI USA. (2009). "Climate Adaptation." from http://www.icleiusa.org/programs/climate/Climate_Adaptation.
Inam, A. (2005). Planning for the Unplanned. New York, Routledge.
IPCC. "About IPCC." from http://www.ipcc.ch/about/index.htm.
IPCC (1996). Climate Change 1996: Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analyses. . R.T. Watson and et al. Cambridge, UK, Intergovernmental Panel on Climate Change.
IPCC (2007). Fourth Assessment Report. Cambridge, UK.
Kelly, P., and W. Adger (2000). "Theory and Practice in Assessing Vulnerability to Climate Change and Facilitating Adaptation." Climatic Change **47**: 325-352.
Kirby, A. (1999). "Climate 'next century's biggest challenge'." from http://news.bbc.co.uk/2/hi/science/nature/478421.stm.
Meyer, O. W., J. Boli, G. M. Thomas and F. O. Ramirez (1997). "World Society and the Nation-State." American Journal of Sociology **103**(1): 144-181.
Moser, C. (1998). "The Asset Vulnerability Framework: Reassessing Urban Poverty Reduction Strategies." World Development **26**(1): 1-19.

Nation of Singapore (2008). Singapore's National Climate Change Strategy. Ministry of Environment and Water Resources. Singapore.

National Statistical Office Thailand. (2006). "Key Statistics of Thailand 2007; Chapter 1.9, Population Projections (1 July) by Region and Sex ", 2008, from http://web.nso.go.th/eng/pub/keystat/key07/key07.zip.

Pielke Jr., R. (2009). Rethinking the Role of Adaptation in Climate Policy. The Earthscan Reader on Adaptation to Climate Change. I. B. E. Lisa Schipper. London, Earthscan.

Ribot, J., Adil Najam, and Gabrielle Watson (2009). Climate Variation, Vulnerability and Sustainable Development in the Semi-Arid Tropics. The Earthscan Reader on Adaptation to Climate Change. I. B. E. Lisa Schipper. London, Earthscan: 117-160.

Roberts, D. (2008). "Thinking globally, acting locally: Institutionalizing climate change at the local level." Environment and Urbanization **20**(2): 521-537.

Sairinen, R. and L. Peltonen (2005). FINADAPT: Adaptation Strategies for Climate Change in the Urban Environment. WP 13: Urban planning. Helsinki, Centre for Urban and Regional Studies, Helsinki University of Technology.

Satterthwaite, D., S. Huq, M. Pelling, H. Reid, P. Romero-Lankao (2007). Building Climate Change Resilience in Urban Areas and Among Urban Populations in Low- and Middle-Income Nations. Building for Climate Change Resilience, Center for Sustainable Urban Development.

Schipper, E. L. (2009). Conceptual History of Adaptation in the UNFCCC Process. The Earthscan Reader on Adaptation to Climate Change. I. B. E. Lisa Schipper. London, Earthscan: 359-376.

Schreurs, M. A. (2008). "From the Bottom Up: Local and Subnational Climate Change Politics." The Journal of Environment & Development **17**(4): 343-355.

Statistics Bureau Japan. (2008). " Monthly Statistics, Population of Major Cities ", 2008, from http://www.stat.go.jp/data/getujidb/zuhyou/b04.xls.

Statistics Canada. (2006). "Population and dwelling counts, for Canada and census subdivisions (municipalities), 2006 and 2001 censuses - 100% data notepad." 2009, from http://www12.statcan.ca/english/census06/data/popdwell/Table.cfm?T=301&S=3&O=D.

Statistics South Africa. (2007). " Community Survey 2007: Basic Results Municipalities." 2009, from http://www.statssa.gov.za/Publications/P03011/P030112007.pdf.

Stern, N. e. a. (2006). Stern Review Report: The Economics of Climate Change: . London, UK, Her Majesty's Treasury.

U.S. Census Bureau. (2008). "2007 Census Bureau Estimate." 2008, from http://www.census.gov/popest/estimates.html.

UN-Habitat. (2007). "Urbanization: Facts and Figures." UN-Habitat Fact Sheet & Backgrounders, from http://www.unhabitat.org/mediacentre/documents/backgrounder5.doc.

Wellington City Council. (2007). "Wellington City Council Annual Plan 2007-2008." 2009, from http://www.wellington.govt.nz/plans/annualplan/0708/pdfs/03snapshot.pdf.

Wheeler, S. M. (2008). "State and Municipal Climate Change Plans: The First Generation." Journal of the American Planning Association **74**(4): 481- 496.

World Gazetteer. (2008). "World: Largest Cities and Towns and Statistics of their populations (London)." 2009, from http://world-gazetteer.com/wg.php?x=&men=gcis&lng=en&des=wg&srt=npan&col=abcdefghinoq&msz=1500&pt=c&va=&srt=pnan.

Appendix A: List of Megacities Searched

Rank	City	Estimated 2015 population
1	Tokyo	26.4
2	Bombay	26.1
3	Lagos	23.2
4	Dhaka	21.1
5	Sao Paulo	20.4
6	Karachi	19.2
7	Mexico City	19.2
8	New York	17.4
9	Jakarta	17.3
10	Calcutta	17.3
11	Delhi	16.8
12	Metro Manila	14.8
13	Shanghai	14.6
14	Los Angeles	14.1
15	Buenos Aires	14.1
16	Cairo	13.8
17	Istanbul	12.5
18	Beijing	12.3
19	Rio de Janeiro	11.9
20	Osaka	11.0
21	Tianjin	10.7
22	Hyderabad	10.5
23	Bangkok	10.1

Source:(UN-Habitat 2007)

Appendix B: List of Capital Cities Searched

Afghanistan - Kabul
Albania - Tirane
Algeria - Algiers
Andorra - Andorra la Vella
Angola - Luanda
Antigua and Barbuda - Saint John's
Argentina - Buenos Aires
Armenia - Yerevan
Australia - Canberra
Austria - Vienna
Azerbaijan - Baku
The Bahamas - Nassau
Bahrain - Manama
Bangladesh - Dhaka
Barbados - Bridgetown
Belarus - Minsk
Belgium - Brussels
Belize - Belmopan
Benin - Porto-Novo
Bhutan - Thimphu
Bolivia - La Paz; Sucre
Bosnia and Herzegovina - Sarajevo
Botswana - Gaborone
Brazil - Brasilia
Brunei - Bandar Seri Begawan
Bulgaria - Sofia
Burkina Faso - Ouagadougou
Burundi - Bujumbura
Cambodia - Phnom Penh
Cameroon - Yaounde
Canada - Ottawa
Cape Verde - Praia
Central African Republic - Bangui
Chad - N'Djamena
Chile - Santiago
China - Beijing
Colombia - Bogota
Comoros - Moroni
Congo, Republic of the - Brazzaville
Congo, Democratic Republic of the - Kinshasa
Costa Rica - San Jose
Cote d'Ivoire - Yamoussoukro; Abidjan
Croatia – Zagreb
Cuba - Havana
Cyprus - Nicosia
Czech Republic - Prague
Denmark - Copenhagen
Djibouti - Djibouti
Dominica - Roseau
Dominican Republic - Santo Domingo
East Timor (Timor-Leste) - Dili
Ecuador - Quito
Egypt - Cairo
El Salvador - San Salvador
Equatorial Guinea - Malabo
Eritrea - Asmara
Estonia - Tallinn
Ethiopia - Addis Ababa
Fiji - Suva
Finland - Helsinki
France - Paris
Gabon - Libreville
The Gambia - Banjul
Georgia - Tbilisi
Germany - Berlin
Ghana - Accra
Greece - Athens
Grenada - Saint George's
Guatemala - Guatemala City
Guinea - Conakry
Guinea-Bissau - Bissau
Guyana - Georgetown
Haiti - Port-au-Prince
Honduras - Tegucigalpa
Hungary - Budapest
Iceland - Reykjavik
India - New Delhi
Indonesia - Jakarta
Iran - Tehran
Iraq - Baghdad
Ireland - Dublin
Israel - Jerusalem
Italy - Rome
Jamaica - Kingston
Japan - Tokyo

Jordan - Amman
Kazakhstan - Astana
Kenya - Nairobi
Kiribati - Tarawa Atoll
Korea, North - Pyongyang
Korea, South - Seoul
Kosovo - Pristina
Kuwait - Kuwait City
Kyrgyzstan - Bishkek
Laos - Vientiane
Latvia - Riga
Lebanon - Beirut
Lesotho - Maseru
Liberia - Monrovia
Libya - Tripoli
Liechtenstein - Vaduz
Lithuania - Vilnius
Luxembourg - Luxembourg
Macedonia - Skopje
Madagascar - Antananarivo
Malawi - Lilongwe
Malaysia - Kuala Lumpur
Maldives - Male
Mali - Bamako
Malta - Valletta
Marshall Islands - Majuro
Mauritania - Nouakchott
Mauritius - Port Louis
Mexico - Mexico City
Micronesia, Federated States of - Palikir
Moldova - Chisinau
Monaco - Monaco
Mongolia - Ulaanbaatar
Montenegro - Podgorica
Morocco - Rabat
Mozambique - Maputo
Myanmar (Burma) - Rangoon (Yangon); Naypyidaw or Nay Pyi Taw
Namibia - Windhoek
Nauru - Yaren District
Nepal - Kathmandu
Netherlands - Amsterdam; The Hague
New Zealand - Wellington
Nicaragua - Managua
Niger - Niamey
Nigeria - Abuja
Norway - Oslo
Oman - Muscat
Pakistan - Islamabad
Palau - Melekeok
Panama - Panama City
Papua New Guinea - Port Moresby
Paraguay - Asuncion
Peru - Lima
Philippines - Manila
Poland - Warsaw
Portugal - Lisbon
Qatar - Doha
Romania - Bucharest
Russia - Moscow
Rwanda - Kigali
Saint Kitts and Nevis - Basseterre
Saint Lucia - Castries
Saint Vincent and the Grenadines – Kingstown
Samoa - Apia
San Marino - San Marino
Sao Tome and Principe - Sao Tome
Saudi Arabia - Riyadh
Senegal - Dakar
Serbia - Belgrade
Seychelles - Victoria
Sierra Leone - Freetown
Singapore - Singapore
Slovakia - Bratislava
Slovenia - Ljubljana
Solomon Islands - Honiara
Somalia - Mogadishu
South Africa - Pretoria; Cape Town; Bloemfontein
Spain - Madrid
Sri Lanka - Colombo; Sri Jayewardenepura Kotte
Sudan - Khartoum
Suriname - Paramaribo
Swaziland - Mbabane
Sweden - Stockholm
Switzerland - Bern
Syria - Damascus
Taiwan - Taipei
Tajikistan - Dushanbe
Tanzania - Dar es Salaam; Dodoma

Thailand - Bangkok
Togo - Lome
Tonga - Nuku'alofa
Trinidad and Tobago - Port-of-Spain
Tunisia - Tunis
Turkey - Ankara
Turkmenistan - Ashgabat
Tuvalu - Vaiaku village, Funafuti province
Uganda - Kampala
Ukraine - Kyiv
United Arab Emirates - Abu Dhabi
United Kingdom - London
United States of America - Washington D.C.
Uruguay - Montevideo
Uzbekistan - Tashkent
Vanuatu - Port-Vila
Vatican City (Holy See) - Vatican City
Venezuela - Caracas
Vietnam - Hanoi
Yemen - Sanaa
Zambia - Lusaka
Zimbabwe - Harare

Appendix C: Cities and Global Network Affiliations

	City	UNFCCC Group	CCI	C40	ICLEI
Global South	Bangkok, THA	Developing Country	Partner	Participant	Member
	Buenos Aires, ARG	Developing Country	Partner	Participant	Member
	Cape Town, ZAF	Developing Country	-	-	Member
	México City, MEX	Developing Country	Partner	Participant	Member
	Quito, ECU	Developing Country	-	-	Member
Global North	Canberra, AUS	Annex 2	-	-	Member
	Dublin, IRL	Annex 2	-	-	Member
	London, GBR	Annex 2	Partner	Participant	Member
	Los Angeles, USA	Annex 2	Partner	Participant	Member
	Madrid, ESP	Annex 2	Partner	Participant	-
	New York City, USA	Annex 2	Partner	Participant	Member
	Ottawa, CAN	Annex 2	-	-	Member
	Paris, FRA	Annex 2	Partner	Participant	-
	Singapore, SGP	Developing Country	-	-	Member
	Stockholm, SWE	Annex 2	Affiliate	-	Member
	Tokyo, JPN	Annex 2	Partner	Participant	-
	Wellington, NZL	Annex 2	-	-	-

Appendix D: List of Interviewees

Organization	Person	Title	Interview Date
INE[1]	Dr. Andrés Flores Montalvo	Director of Climate Change Research	8/6/08
Colegio de México	José Luis Lezama de la Torre	Director of CEDUA[2]	8/18/08
State of México - Secretary of the Environment	Cesar Reyna	Coordinator of the Metropolitan Environment	8/19/08
Federal District - Secretary of the Environment	Oscar Vasquez	Subdirector of Climate Change	8/20/08
Colegio de México	Vicente Ugalde Saldaña	Professor in CEDUA[2]	8/21/08
Federal District – PAOT[3]	María Del Carmen Rodríguez Juárez	Technical and System Coordinator	8/25/08
Colegio de México	Marta Schteingart	Professor in CEDUA[2]	8/26/08

Notes:
1. *El Instituto Nacional de Ecología* (National Institute of Ecology)
2. *Centro de Estudios Demográficos, Urbanos y Ambientales* (Center of Demographic, Urban, and Environmental Studies)
3. *Procuraduría ambiental y del ordenamiento territorial del Districto Federal* (Office of the Judge Advocate General of the environmental and territorial legislation of the Federal District)