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Case Studies of Vulnerability and Resilience in Kenya and Nicaragua

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Sustainable Development Network
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1818 H Street NW
Washington DC 20433
Telephone: 202-473-1000
Web site: www.worldbank.org
E-mail: feedback@worldbank.org

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ABBREVIATIONS AND ACRONYMS

ACCCRN	Asian Cities Climate Change Resilience Network
ACRA	Italian Third World rural development organization
ADB	Asian Development Bank
AMPYDE	*Asociación de Mujeres por la Paz y Desarrollo de Estelí* (Women's Association for Peace and Development in Estelí)
AR4	IPCC Fourth Assessment Report
ASODEA	*Asociación de Educadores Ambientalistas de Nicaragua* (Nicaraguan Association of Environmental Educators)
CBO	Community Based Organization
CCAF	Community-based Climate Change Adaptation Funds
CCA	Climate Change Adaptation
CDD	Community Driven Development
CDF	Constituency Development Fund
CODEPRED	Departmental Committee for the Prevention, Mitigation and Attention to Disasters (Nicaragua)
CODETI	Coast Development Transparency Initiative (Mombasa)
COMPURED	Municipal Committee for the Prevention, Mitigation and Attention to Disasters (Estelí)
COSUDE	*Agencia Suiza para el Desarrollo y la Cooperación* (Swiss Agency for Development and Cooperation)
CPC	*Comité de Poder Ciudadano* (Citizen Power Commitee, Estelí)
CRF	Coast Rights Forum (Kenya)
DANIDA	Danish International Development Agency
DC	District Commissioner (Mombasa)
DO	District Officer (Mombasa)
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EMCA	Environmental Management and Coordination Act (Kenya)
ENACAL	*Empresa Nicaragüense de Acueductos y Alcantarillados Sanitarios* (Nicaraguan Water and Sewerage Company)
ENEL	*Empresa Nicaragüense de Electricidad* (Nicaraguan Electricity Company)
ENITEL	*Empresa Nicaragüense de Telecomunicaciones* (Nicaraguan Telecommunications Company)
ESW	Economic and Sector Work (World Bank)
FAO	Food and Agriculture Organization
GEF	Global Environmental Facility
FAREM	*Facultad Regional Multidisciplinaria* (Multidisciplinary Regional Faculty, part of the Autonomous University of Nicaragua)
GURC	Global Urban Research Center (University of Manchester)
ICZM	Integrated Coastal Zone Management Policy (Kenya)
INPRHU	*Instituto de Promoción Humana* (Human Development Institute, Nicaragua)
INSFOP	*Instituto de Formación Permanente* (Continuous Education Institute, Nicaragua)
IPCC	Intergovernmental Panel on Climate Change
JICA	Japan International Cooperation Agency
KARI	Kenya Agricultural Research Institute
KENSUP	Kenya Slum Upgrading Program
KIKODEP	Kisauni Community Development Program
LICODEP	Likoni Community Development program (Mombasa)
MAGFOR	*Ministerio Agropecuario y Forestal* (Ministry of Agriculture and Forestry, Nicaragua)

MARENA	*Ministerio del Ambiente y Recursos Naturales* (Ministry of Environment and Natural Resources, Nicaragua)
MEM	Ministry of Energy and Mining, Nicaragua
MINED	Ministry of Education (Nicaragua)
MPA	*Marco Programático de Adaptación* (Nicaraguan Adaptation Framework to Climate Change)
MTI	Ministry of Transport and Infrastructure (Nicaragua)
MUHURI	Muslims for Human Rights
NADIMA	National Disaster Management Agency
NEMA	National Environmental Management Agency, Kenya
NGO	Non-governmental organization
NITLAPAN	*Instituto de Investigación Aplicada y Promoción del Desarrollo Local* (Institute for Applied Research and the Promotion of Local Development)
NSCC	National Strategy on Climate Change
ORCHID	Opportunities and Risks of Climate Change and Disasters
PC	Provincial Commissioner (Kenya)
PCCAA	Participatory Climate Change Adaptation Appraisal
PRODEL	*Fundación para la Promoción al Desarrollo Local* (Foundation for the Promotion of Local Development, Nicaragua)
Proniño	Social action program against child labor managed by *Telefónica Group* and operating across Latin America
PWD	people with disabilities
PRA	Participatory Rural Appraisal
PUA	Participatory Urban Appraisal
RRIA	Rapid Risk and Institutional Appraisal
Sida	Swedish International Development Cooperation Agency
SINAPRED	*Sistema Nacional para la Prevención, Mitigación y Atención de Desastres* (National System for Disaster Prevention, Mitigation and Response)
SRES	Special Report on Emissions Scenarios
UNAN	*Universidad Nacional Autónoma de Nicaragua* (National Autonomous University of Nicaragua)
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change

Vice President, Sustainable Development Network:	Katherine Sierra
Director, Social Development Department:	Cyprian F. Fisiy
Sector Manager, Social Development Department:	Elisabeth Huybens
Task Team Leader, Social Development Department:	Andrew P. Norton

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EXECUTIVE SUMMARY

Poor urban populations in Southern cities are already experiencing the negative impacts of changing weather patterns associated with climate change and climate variability, and future projections suggest that these impacts will get worse. While extreme weather disasters often receive research, media and policy-focused attention, to date there is insufficient evidence base to show that the less dramatic, slow, incremental and often unnoticed, impacts of increasingly severe weather are equally important in terms of their cumulative impact on human wellbeing.

The objective of this ESW is to address these gaps by better understanding what poor households, small businesses and communities are doing to cope with such climate change impacts (experienced as increasingly variable and capricious weather patterns), as well as by identifying how policy and institutional systems can best build on local realities to develop pro-poor urban climate change adaptation actions, particularly relating to resilience.

To accomplish this objective, two urban sites were selected to pilot an associated participatory methodology — Mombasa in Kenya and Estelí in Nicaragua. Site selection was based on the following criteria: a) secondary cities where much of the anticipated growth in urban populations over the next 20 years will be concentrated, and yet are under-studied in the work carried out so far on climate change adaptation in urban centers, and; b) cities that do not fall into existing 'high-profile' categories for climate change impacts (sea level rise or storm surge) — leaving open the question as to the kinds of impacts currently being experienced in non-disaster contexts; c) cities that represent two continents (Africa and Latin America) where relatively less work is being done at present on urban vulnerability assessment (compared to East and South Asia).

The methodology is based on a framework which analyzes the assets of poor individuals, households and communities, both in terms of their vulnerability to severe weather events, as well as their sources of resilience for dealing with the negative impacts of climate change — with the range of assets grouped under a typology of: physical, financial, natural, human and social capital. The methodology has three components; most importantly an innovative new participatory climate change adaptation appraisal methodology (PCCAA) undertaken in four urban settlements in each city, an urban level rapid risk and institutional appraisal (RRIA), and finally a consultation and validation process conducted with a range of key selected stakeholders from government, civil society and local communities.

Despite the absence of detailed 'downscaled' models of future climate change impacts in both cities, the study was able to reveal the ongoing significance of climate change and climate variability both in terms of the vulnerabilities of local populations, and the actions that they take to adapt to the increasing impacts of changing local weather patterns.

The major findings of the study were as follows:

- There is a mismatch between the dominant national framing of the climate change policy debate and the realities of poor urban communities in the two case study countries in two important ways. First, the framing of the climate change adaptation policy debate is primarily rural — while the findings of these studies show significant impacts on the urban poor. Secondly, the adaptation debate is framed primarily in terms of Disaster Risk Management. Insofar as climate change is perceived as relevant to urban communities at all it is through the 'disaster' lens.
    - This framing has some advantages in policy terms. It creates a sense of urgency and priority in response. However, it leads to a significant blind spot. The urban populations of the study sites were experiencing increasing problems with micro level severe weather (particularly problems of flooding and wind). Nevertheless such problems were not visible in the 'disaster' framing used by the major national institutions. There is therefore a risk that the adaptation needs and priorities of poor urban populations in sites where impacts are slow and incremental — rather

than rapid and dramatic — will be ignored by national and international policy communities, with serious negative impacts for the majority of the world's urban poor.

- The study found that the most significant asset of the urban poor (as they listed themselves) was housing. This highlighted a critical dimension of their vulnerability — namely weak or unclear tenure rights. In effect weak tenure rights covers a striking array of different situations — ranging from tenants of informal landlords through to the 'totally' informal situations of some recently settled communities. It also encompasses some highly ambiguous situations; in Mombasa, for example, in one settlement some land had been occupied by militias — who were effectively operating a land market themselves without holding formal legal title to the land concerned.
    - The climate change-related consequences of weak tenure rights were significant and included: the inability to access services, or make claims for interrelated basic service provision of significance for resilience to weather-related hazards (e.g. garbage collection, sewage and drainage); weak incentives to increase the resilience of the housing structures; a tendency to be concentrated physically on the most exposed and hazardous sites. From a policy perspective improving the efficiency of land administration and management can help build the adaptation capacity of poor people in urban areas. At the same time such initiatives need to be implemented collaboratively with community commitment and participation or climate change adaptation activities may become perceived as a threat by informal settlers, and an excuse to evict them.

- The study found a great variety of responses to the increasing severity of local weather patterns at household, small business and community level. These included asset adaptation to build long term resilience (for example homeowners in Ziwa La Ngombe, Mombasa mobilized in order to seek assistance from donors, dug water passages in case of flooding, while small business owners constructed concrete walls to protect against flooding), asset damage limitation and protection during severe weather events (such as moving temporarily to safer places or sleeping on top of houses, and placing sandbags in the doorways of houses during floods), and asset rebuilding after such weather (for example inhabitants of 29th October, Estelí replanted trees and plants, while those living in Timbwani and Bofu, Mombasa accessed weather forecasters which informed people of the occurrence of severe weather).
    - National governments, NGOs, donors, private sector, and researchers very rarely see or are aware of the asset-based adaptation strategies that groups in the community, households and small businesses are already implementing. The findings of this study suggest that delivering resources to the local level to support these strategies can be an effective part of long term investment for building resilience in the face of climate change. A key first stage in this is being able to understand how communities are already experiencing and responding to climate change.

- The rapid risk and institutional appraisal revealed that the implementation of climate change adaptation strategies at city and country level in both case studies was affected by a number of constraints. In both countries national climate change coordinating committees, with the mandate to advise on climate policy issues, were located in predominantly rural focused Ministries of Environment. In addition there was an overlap between different legal instruments, and a lack of clear mandate or effective coordination of programs within and between sector ministries as well as among the various levels of government (national, provincial, and local). Finally, the absence of concrete fiscal support was also a serious limitation to adaptation policies. Clear legal and institutional coordination and funding channels, relevant to urban areas, would make national adaptation strategies more meaningful in terms of supporting the efforts of the urban poor to build the necessary resilience to protect their assets.

In conclusion, the findings of this study suggest that urban vulnerability assessments and urban adaptation planning should generally include a component which looks in detail at the current realities of climate change for the urban poor — in terms of the negative impacts of changing weather patterns, and the strategies which they employ to build resilience. The methodology outlined in Annex I builds on two bodies of work to offer a model for

this — the practice of participatory research, and the analysis of vulnerability through the assessment of the asset base of poor households and communities.

Points of Action

The experience gained in the two pilot exercises (Mombasa and Estelí) suggests the following:

- Engaging local institutions to carry out participatory appraisals of climate change impacts and responses (PCCAAs) can also help to build local capacity and develop an understanding of climate change policies and impacts necessary to work with households, communities and businesses on strengthening their adaptation capacity.
- Trusted local institutions, whether community based organizations (CBOs) and NGOs (as in Mombasa) or local government (as in Estelí) can provide critically important institutional structures for the delivery of community-based climate change adaptation funds (CCAF). Engaging such institutions can combine channeling funding to practical adaptation activities (e.g. improving the flood defenses of local schools) with strategic measures to develop the capacity of poor urban communities to make claims on urban services and lobby for stronger tenure rights. To ensure that such funds, designed to build resilience against future severe weather patterns, reach the intended local poor populations, will require assessments of the appropriateness of existing models for community-based development and the field-testing of context specific Climate Change Adaptation Funds. The Mombasa and Estelí field sites used for this study could provide useful testing grounds for the development of new models of support for building local level resilience in the face of climate change impacts.

I. INTRODUCTION

1.1 Background and Objectives

Typically, the practice of assessing the vulnerability of urban areas to climate change impacts, and the related process of planning adaptation measures, takes place without much reference to people in poor urban communities. This is partly because such activities rarely extend beyond the community of officials and planners who are engaged in physical planning processes in public institutions. But it is also because the urban poor are often effectively shut out of any possibility of access to deliberations of this kind — not least because of the informal nature of their communities and tenure arrangements, which generally leads to a level of invisibility and lack of voice in relation to all formal planning processes. It is worth noting that exclusion from adaptation planning can lead to more than just a lack of benefits. Where the primary problem is flooding, for example, increasing the defenses of the commercial and formal residential areas may actually send more water the way of the informal settlements — impacting those least able to cope.

The objective of this ESW is to address these gaps by piloting a methodology capable of quickly and cost-effectively introducing into adaptation planning processes an appreciation of the significance of climate change impacts for poor people in informal urban settlements. Specifically in the two case study sites (Mombasa in Kenya and Estelí in Nicaragua) we sought to a) make visible climate change impacts of various kinds on poor people, b) illustrate what poor households, small businesses and groups in communities are doing to cope with such climate change impacts (experienced as increasingly variable and capricious weather patterns), and c) identify how policy and institutional systems can best build on local realities to develop pro-poor urban climate change adaptation actions, particularly relating to resilience.

In order to do this, the report introduces an asset-based framework to analyze the vulnerability of urban poor people to severe weather events — whose frequency or intensity climate change may be increasing, and is very likely to increase in the future — as well as their asset-based adaptation strategies as a source of long-term resilience, to cope with the onset of severe weather and to rebuild after such events. Based on this, it seeks to recommend specific strategies and programmatic interventions with positive impacts on poor households and their local communities that can be adopted and implemented by local authorities and institutions seeking to address the impacts of climate change.

The use of an asset adaptation framework to better understand vulnerability and sources of resilience is intended to contribute to two current debates of relevance to the social dimensions of urban climate change. At a conceptual level is the debate concerning approaches to assess urban vulnerability to climate change. In operational practice is the debate on the similarities and differences, strengths and weaknesses of disaster risk reduction as against climate change adaptation as approaches to address climate change risks and impacts.

The importance of this study relates to the fact that urban centers of low and middle-income countries concentrate a large proportion of those most at risk from the effects of severe weather associated with climate change — as lives, assets, environmental quality and future prosperity are threatened by "the increasing risk of storms, flooding, landslides, heat waves and drought and by overloading water, drainage and energy supply systems"[1].

The study follows up on discussions held during the international workshop on Social Dimensions of Climate Change held by the World Bank's Social Development Department in March 2008, as well as the 5th Urban Research Symposium on Cities and Climate Change held in Marseilles in June 2009. More specifically, it builds on the conceptual framework developed by Caroline Moser and David Satterthwaite (Moser, C.; Satterthwaite, D.

[1] Wilbanks, Romero Lankao et al (2007).

2008), and then further developed by Caroline Moser in a paper presented at the Urban Research Symposium (Moser 2009a).

The report describes an analytical framework and action research methodology developed so as to enable local authorities and other relevant institutions to incorporate socio-economic vulnerability and local level asset-based adaptation into climate change adaptation actions and strategies.

Of the various initiatives currently underway to help urban authorities develop plans and policies to cope with the impacts of climate change, the innovative element of this exercise was in combining three elements:

(i) A methodology to understand the lived experience of vulnerability associated with increasing climate variability from the perspective of residents of poor urban areas;
(ii) Linking this perspective to institutional analysis i.e. respective response roles of national governments, urban authorities, communities and households;
(iii) Bringing these two elements together in facilitated discussions with urban authorities to support them in thinking through the implications of increasing climate variability for planning and policy.

1.2 Approaches to Assessing Urban Vulnerability

The concept of vulnerability is not new and is most widely understood as the degree to which systems (e.g. households, communities, and organizations) are susceptible to loss, damage, suffering and death in the event of a 'natural' hazard or disaster (Wamsler, 2007). Within the climate change research community, vulnerability has also been defined either as a function of exposure, sensitivity and adaptive capacity of a system (see McCarthy et al. 2001 (IPCC); Romero Lankao and Tribbia 2009; Adger 2006; Gallopin 2006) or only as function of exposure and sensitivity to adverse events where adaptive capacity forms part of the system's resilience i.e. an antipode of vulnerability. According to these definitions *exposure* is understood as the nature and degree to which a system experiences a stress or hazard. Hazards may be extreme events of short duration — heat-waves, storms, etc.; however they could also be more gradual phenomena such as sea-level rise, increasing temperatures or precipitation. *Sensitivity* can be viewed as the degree to which a system is modified or affected by disturbance (Gallopin 2006; Manuel-Navarette et al. 2007). *Adaptive capacity*, on the other hand, is the inherent ability of a system to evolve or undertake actions in order to avoid loss and/or speed recovery from hazard.

This particular study is interested in understanding how the vulnerability and resilience of individuals, households, and communities in urban centers are susceptible to, unable to avoid, or cope with the adverse effects of the stresses or hazards related to 'extreme weather', 'severe weather' and 'climate variability'; and how these are determined by a wide range of factors including the characteristics of persons, as well as the physical, social, economic, and institutional environment. In this sense, the concept of asset vulnerability, used as a basis for this study, incorporates an analysis of a range of resources or assets held by individuals, households and communities, and as such allows for assessing the diverse nature of sensitivity of urban residents both to incremental climate changes as well as to disaster events (see Moser and Satterthwaite 2008; Moser 2009a).

Assessing climate change vulnerability of urban centers has only recently become a focus of concern for development agencies given that national climate change assessments and strategies have primarily concentrated on environmental and agricultural systems. As the Commission on Climate Change and Development has pointed out, "[c]ities and city dwellers have received too little attention in discussions of climate change impacts and adaptation" (CCCD 2009, p. 72). In the past few years, however, various development institutions have taken up the challenge to provide city governments with the necessary tools to integrate climate change adaptation into their policies. As a result a number of methodologies for urban vulnerability assessments and disaster and adaptation planning are currently emerging and being piloted in large and mid-size cities in the developing world.

These methodologies, summarized in Table 1 below, all incorporate a diagnostic component (of vulnerable areas, groups, or types of hazards that are most likely to impact a city) and have the objective to influence local policy-

planning — either directly by creating local action plans or indirectly through sharing their results with local authorities. The approaches also have in common a knowledge-sharing goal, a number of them being structured as regional city networks. Yet, there are also important differences among these approaches. Some have looked for methodologies to identify vulnerability 'hot spots' using climate data scenarios and downscaling methods to the city level (World Bank, ICLEI). In addition, the World Bank/ADB/JICA initiative on coastal cities has sought to estimate damage costs of potential hazards. Other approaches combine scientific vulnerability mapping with policy and institutional mapping at the city level to assess the capacity of local authorities to deal with projected hazards. Some assessment methodologies are mainly research-oriented aiming to share results with local partners (Action Aid, ICLEI, World Bank/ADB/JICA) while others are directed to the development of local action plans (ACCCRN, World Bank East Asia and North Africa regions). With the exception of ACCCRN, which targets mid-sized Asian cities, all current assessment methodologies have been applied to large urban centers. The World Bank's Urban Development and Local Government group is currently working at creating a common methodology for urban risk assessments that includes: institutional mapping, collection and ground-truthing of climate data and modeling for disaster risk and climate change.

At the same time, *relatively little guidance to urban authorities exists on assessing the needs and adaptation strategies of the poorest urban dwellers.* With the exception of the Asian Cities Climate Change Resilience Network and Action Aid International, vulnerability assessments do not engage directly with urban communities except for ground-truthing of scientific data. Marginalized groups commonly inhabit the most hazardous areas of a city and are generally more vulnerable to adverse weather than other urban groups due to lack of basic services and adequate infrastructure (Bicknell, Dodman, Satterthwaite 2009). Yet, their perspectives on the effects of climate variability on their households and communities are largely unknown. Hence it is likely that the results of current assessment methodologies will focus disproportionately on physical and institutional vulnerability at the local government level and would not take into account other local points of vulnerability as well as other local sources of resilience within households and communities.

Capturing the perceptions of the urban poor on the impacts of weather change and understanding their adaptive strategies is also important given the rising number of poor and informal urban settlers. Around the world, over 1 billion (or one in three) urban inhabitants currently do not have adequate access to water and sanitation, live in overcrowded conditions, live in poor quality, temporary shelters or lack security of tenure. The number of slum dwellers is predicted to double to 2 billion by 2050 (UN Habitat, 2008/9; Rockefeller 2009). It is estimated that more than 80 percent of the urban population in Nicaragua and over 70 percent in Kenya lives in slums (UN Habitat 2006/7). Drawing from a survey conducted in 16 urban areas in Nicaragua in 2001, only 9 percent of houses were considered durable based on UN Habitat's durability standards (floor, walls and roof quality) (UN Habitat 2006/7).

In addition, *current approaches to urban vulnerability assessments are implicitly or explicitly based on the prospect of climate disasters e.g. flooding in coastal cities, while no current methodology has been developed to assess the vulnerability of city-dwellers to ongoing adverse or severe changes in weather.* While weather relates to day to day changes, climate change refers to the types of weather change over lengthy periods of up to 30 years; current preoccupations with 'climate change' means the two are often conflated. The research on Mombasa and Estelí, presented in this study, shows that despite the lack of concrete climate projections, the lives and livelihoods or urban residents are already significantly impacted by incremental shifts in weather e.g. higher intensity of rainfall causing seasonal flooding, increasing speed of winds or gradually rising temperatures. The methodology tested in these two case studies enables local authorities to recognize vulnerabilities to ongoing climate challenges so they can better support the adaptive efforts already employed by citizens.

Table 1: Approaches to Urban Vulnerability Assessments

Organization	Program/Initiative	Approach	Where has it been applied?
Action Aid International	Cities and Climate Change *Climate Change, Urban Flooding and the Rights of the Urban Poor in Africa (2006)*	A Participatory Vulnerability Assessment including interviews with communities and various stakeholders at the city level to understand the impacts of flooding and adaptation strategies of the poor.	Accra, Freetown, Kampala, Lagos, Maputo, Nairobi
ICLEI — Local Governments for Sustainability	*Preparing for Climate Change: A Guidebook for Local, Regional and State Governments (2007)*	A three-step vulnerability assessment: (i) Sensitivity analysis in the planning area based on observed and projected climate data, available resources and an assessment of the impact threshold of the urban system; (ii) Evaluation of the city's adaptive capacity including legal and regulatory, economic, governance and biophysical factors; and (iii) combining findings from (i) and (ii) to prioritize vulnerable locations or communities and suggest adaptation measures.	Disseminated through ICLEI's network, which includes over 1,100 cities, towns and counties mostly in Europe, North America, Australia and Oceania.
Asian Cities Climate Change Resilience Network (ACCCRN)	Asian Cities Climate Change Resilience Network (ACCCRN) *(sponsored by the Rockefeller Foundation)*	Mobilize key stakeholders in each city (CBOs, local governments, etc.) to: (i) identify vulnerable locations and groups; (ii) develop locally-appropriate resilience plans; (iii) share learning within the network of Asian cities.	Mid-size Asian cities. The first 10 pilots are: Surat, Indore, Gorakphur (India); Da Nang, Quy Nhon, Can Tho (Vietnam); Chiang Rai, Hat Yai (Thailand); Bandar Lampung, Semerang (Indonesia)
World Bank, East Asia Region	Climate Resilient Cities *Climate Resilient Cities: 2008 Primer*	Combines a participatory self-assessment by local authorities with an external spatial analysis that identifies spots of risk and subsequently — the drawing of detailed maps of the 'hot spot' areas. Looks at existing city policies to identify gaps in policy and institutional capacity. Creates Local Resilience Action Plans including a list of priority adaptation measures, actors who can implement them, expected cost and financing opportunities, as well as an expected time frame for putting them in practice.	Can Tho, Dong Hoi, Hanoi (Vietnam)
World Bank, Environment Department Asian Development Bank JICA	Coastal Cities and Adaptation to Climate Change	Assess potential impacts of flooding for the year 2050: (i) Downscale climate impacts to the city/river basin level; (ii) Map hydrology of urban watershed in GIS maps; (iii) Estimate damage costs; conduct cost benefit analysis of adaptation options.	Manila Ho Chi Minh city Bangkok Kolkata
World Bank, Middle East and North Africa Region	Climate Change Adaptation and Disaster Preparedness in Coastal Cities of North Africa	Assess vulnerability for the year 2030 in five areas: (i) sea level rise, coastal erosion and submersion; (ii) urban flooding; (iii) water resource availability; (iv) increase in room temperature; (v) earthquakes and tsunamis. Develop action plans to improve cities' adaptation.	Alexandria Casablanca Tunis
World Bank/ University of Manchester — GURC	Asset-based Climate Change Adaptation Framework	A participatory research methodology with three components: (i) Participatory Climate Change Adaptation Appraisal; (ii) Rapid Risk and Institutional Appraisal; and (iii) Consultation and validation of results.	Estelí (Nicaragua) Mombasa (Kenya)

Sources: Action Aid International (2006); Bigio (2009); ICLEI (2007); Rockefeller Foundation (2009); World Bank (2008; 2010a); Moser and Stein (2010).

1.3 Disaster Risk Reduction and Climate Change Adaptation — the Significance of the Frame

Over the past decade a diversity of complex, interrelated and often overlapping approaches have sought to address the impacts of climate change. In essence, however this is a debate, often contentious, as much as anything about the nature and time frame of the threat[2]: is climate change an increase in the magnitude and frequency of short-term extreme events or disasters, similar to an earthquake or tsunami, as the disaster risk reduction/management (DRR/DRM) approach suggests, or is it about slow trends in the increasing variability and intensity of weather (and associated precipitation and temperature regimes), as the more recent climate change adaptation (CCA) approach promotes? And, associated with this, are responses then focused on top-down disaster relief during or after extreme weather events (Sperling and Szekely, 2005) or incremental responses to the slow impacts of long-term trends in increasing severity of weather, which are invidious and sometimes imperceptible (Hellmuth et al, 2007. Moser et al 2010)?

Despite increasing convergence between these two approaches they differ in terms of historical period when developed, key objectives and current emphases and have operated largely in isolation from each other (Tearfund 2008, p.3; see Annex III). DRR, subsequently transformed into Disaster Risk Management (DRM), with its origins in humanitarian emergency relief, has a 30 year track record in addressing disasters. However, as a consequence of the Hyogo Framework for Action 2005-2015[3], DRM underwent a paradigm shift to include the pre-disaster stages of hazards (FAO, 2008), with its overall focus expanding to encompass emergency response, prevention, mitigation and preparedness of neighborhoods for natural disasters (Wamsler, 2007). Closely linked, was Climate Risk Management[4], which, as the name implies sought to bridge the management of risk to climate change.

Box 1: Climate change definitions

Climate change adaptation:
'An adjustment in natural, or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits benefit opportunities'
(McCarthy et al. (IPCC) 2001)

Disaster risk reduction:
'The broad development and application of policies, strategies and practices to minimize vulnerabilities and disaster risk through society, through prevention, mitigation and preparedness'
(Twigg, 2004)

More recent approaches with environmental climate science as their centre of concern have focused specifically on both vulnerability and adaptation, as suggested by such approaches as Climate Change Adaptation (CCA) and Climate Change Vulnerability Resilience. Spearheaded by the fact that mitigation responses have been slow and inadequate (Reid and Huq 2007), climate change adaptation approaches, with their scope narrower than DRM, deal only with climate-related or 'hydro-meteorological' hazards; however, such approaches have a far longer time dimension that DRM, and one that factors in the impacts of climate change on biodiversity, changes in ecosystem service and the spread of climate-sensitive diseases (Tearfund 2008, p. 3). In addition they prioritize the building up of long-term resilience, rather than planning for dramatic climate shocks (van Aalst et al, 2006).

In the Climate Change Adaptation approach, a useful distinction has been made between *ex ante* (anticipatory) and *ex-post* (reactive) adaptation, as well as between planned and autonomous adaptation. Most initial climate change adaptation is ex-ante and top-down, lending itself to large-scale, technological solutions (Tanner and Mitchell 2008). Criticism of this approach as tending to ignore the social determinants of vulnerability (Prowse and Scott 2008), has resulted in a range of more inductive community-based approaches to adaptation, that build on existing risk-coping strategies of individuals and communities (Reid and Huq 2007). While community-based approaches to poverty reduction have been widely implemented in the past decades as a consequence of the work of CBOs, NGOs and participatory approaches to development, (see Chambers 1992), recently, building on the same

[2] See Thomalla, F. et al (2006)
[3] The Hyogo Framework for Action (HFA) 2005-2012 was agreed by 168 governments in Kobe, Japan in 2005, to facilitate a comprehensive system-wide, risk-reducing approach to climate change adaptation
[4] See for instance, ORCHID (Opportunities and Risks of Climate Change and Disasters), identified as a 'managerial response to mainstreaming climate risk management' (see Tanner and Conway 2006).

principles this approach has also turned its focus to climate change adaptation. Principles include the fact that outside agencies must gain the trust of local communities, and that future adaptation initiatives as a form of action-research must be embedded in local communities existing knowledge and must be based on local community members' participation (Prowse and Scott 2008).

In order to have a consistent terminology in this study we refer to a climatic event which would register with the international community as a disaster as *extreme weather* (in line with the common description of 'extreme weather event' for cyclones/hurricanes with associated fatalities). Hurricanes and other storms are likely to become more intense in a warming world, although changes to frequency and location are less certain. Extensive droughts (e.g. leading to aid response, fatalities, and substantial population movements) are also sometimes referred to as extreme weather events. In contrast, we refer to the negative impacts of an extensive range of climate trends/events which would not register as a disaster with the international community as *severe weather*. This includes storms and flooding (at a local level), drought and heat stress. Trends of this kind can also lead to fatalities (for example through increasing vulnerability of communities to malaria, dysentery or heatstroke) but there is no public accounting of these kinds of indirect effects. Both of these phenomena form part of the changing climate and the way it impacts the urban poor. By their nature extreme weather events are more publicly visible, so an understanding of the realities of increasingly severe weather, that impacts lives and livelihoods in less dramatic ways but is probably more widespread, is important.

1.4 The Climate Change Asset Adaptation Framework and Study Methodology

The framework introduced in this study incorporates both the conceptual analysis of vulnerability addressed in section 1.2, as well as the operational approach to climate change adaptation relating to climate variability introduced in section 1.3. It does so from the perspective of assets, linking vulnerability, assets and climate change.[5] The framework comprises the following two key components:

(i) At the analytical level it identifies ***sources of vulnerability*** in terms of the mechanisms through which variability associated with climate change impacts lead to the erosion of assets, and

(ii) At the operational level it classifies the ***sources of resilience*** that enable households and communities to protect themselves, or to recover from, the negative effects of severe weather associated with climate change. As such the asset adaptation framework can be instrumental when designing policy solutions for climate change adaptation.

Vulnerability can be identified in terms of two dimensions: first, an external dimension that comprises the risks, shocks, and stresses to which people are subject; and second, an internal dimension that encompasses their capacity and associated means to withstand, or adjust, to damaging losses. In the context of the broad climate change literature vulnerability is primarily seen as 'biophysical' and concerns human exposure to threats provoked by climate change. This relates to the external dimension of vulnerability and comprises the potential damage caused by shocks (such as sudden climatic events like hurricanes) or trends (such as environmental degradation over time). The social dimensions of vulnerability to climate change, in contrast, predominantly focus on the internal dimension—namely how the assets, institutions, and relationships people are affected by such external threats, and in turn deal with them.[6] The capacity of individuals, households and communities to deal with such impacts determines their resilience to weather stress.

Climate change vulnerability, therefore, is closely linked to assets (see Box 2). The more and diverse assets people have, the less vulnerable they are, and the greater the erosion of people's assets, the greater their insecurity.[7] Poor populations are particularly vulnerable to climate change not only in terms of individual assets such as human

[5] Assets are commonly defined as a "stock of financial, human, natural or social resources that can be acquired, developed, improved and transferred across generations." Ford (2004)

[6] Mafalda Duarte, Rachel Hannah Nadelman, Andrew Norton, Don Nelson and Joanna Wolff (2007)

[7] Moser (1998)

and social capital, but also in terms of household, small business and community assets such as financial and productive assets.

Box 2: Definition of the most important capital assets for individuals, households and communities

- Physical capital: the stock of plant, equipment, infrastructure and other productive resources owned by individuals, the business sector or the country itself.
- Financial capital: the financial resources available to people (savings, supplies of credit).
- Human capital: investments in education, health and nutrition of individuals. Labor is linked to investments in human capital; health status influences people's capacity to work, and skill and education determine the returns from their labor.
- Social capital: an intangible asset, defined as the rules, norms, obligations, reciprocity and trust embedded in social relations, social structures, and societies' institutional arrangements. It is embedded at the micro-institutional level (communities and households) as well as in the rules and regulations governing formalized institutions in the marketplace, political system and civil society.
- Natural capital: the stock of environmentally provided assets such as soil, atmosphere, forests, minerals, water and wetlands. In rural communities land is a critical productive asset for the poor; in urban areas, land for shelter is also a critical productive asset.

Source: Moser (2007)

Asset-based approaches to development are rooted in the 1990s debates on poverty reduction and vulnerability. Closely linked to the concept of capabilities, assets are identified as the basis of agents' power to act, to reproduce, challenge or change the rules that govern the control, use and transformation of resources.[8] In the context of climate change, an asset-based adaptation strategy includes a number of basic principles, among which: *Firstly*, that adaptation does not take place in a vacuum and is constantly shaped by government policy, political institutions, and non-governmental actors; *Secondly*, that assets are highly interrelated and facilitating the adaptation of one may affect others and vice versa — the erosion of one may impact others; *Thirdly*, household asset portfolios are not stable and may change — either over time or abruptly — in response to external shocks or internal changes e.g. death, marriage, etc. Another key feature of the asset-based approach is that it focuses, on the one hand, on local government adaptation policy, and on the other — on community, small business and household responses, their ability to negotiate and be active in decision-making.

In recent research, Moser (2007; 2009a) distinguished between an *asset index framework* as a diagnostic tool for understanding asset dynamics and mobility, and an *asset accumulation policy* as an operational approach for designing and implementing sustainable asset-accumulation interventions. In adapting this framework for research on climate change it is necessary to identify both the vulnerability of urban poor people to climate change, as well as their sources of resilience before, during and after the onset of severe weather events. Complementing this is an appraisal of the current climate change institutional policy domain at both national and local level. Together both sources of information provide the basis for local-level policy-makers and other local stakeholders (civil and community organizations) to propose concrete climate change adaptation policies and to provide specific strategies and programmatic interventions that can be adopted and implemented by local authorities and institutions with positive impacts on poor households and their local communities.

The ESW draws heavily on two case studies, undertaken in Mombasa and Estelí (see below), which tested a unique participatory fieldwork methodology that comprised the following three components:

a. Participatory Climate Change Adaptation Appraisal (PCCAA)

A participatory appraisal of the mechanisms through which climate variability directly or indirectly leads to the erosion of assets was undertaken with different social groups of the urban poor in both cities. This included community, small-business and household perceptions of the impact of severe weather on their assets, their perception on current policies, programs and institutions that directly or indirectly help or constrain their adaptive

[8] Sen, A. (1997)

capacity, as well as their recommendations concerning pro-poor adaptation policies. The PCCAA comprised the following two components:

An ***asset vulnerability analytical framework*** assisted in the identification of the links between vulnerabilities and assets. These relate both to external shocks and stresses, as well as to internal capacities to resist or withstand them. This framework focused particularly on three types of vulnerability; first *spatial and physical* vulnerability experienced by local populations as a result of the terrain, second, the *politico-legal* vulnerability relating to insecure tenure rights to housing and land and resulting in inadequate provision of important essential physical infrastructure; third, *social vulnerability* of those groups most at risk to increasing intensity of severe weather.

An asset-based adaptation ***operational framework*** sought to identify adaptation strategies as households, small businesses and communities exploited opportunities to develop resilience and to resist or recover from the negative effects of severe weather. Three closely interrelated phases of adaptation were usefully identified.[9]

- Asset-based adaptation to build long-term resilience
- Asset damage limitation and protection during severe weather events
- Asset rebuilding after severe weather

For each phase adaptation actions were identified along with associated institutions that supported or undermined these actions at household, community and government level. Obviously, the greater the success in building long-term resilience, the less was the need for intervention in the later phases.

The PCCAA methodology was adapted from a rapid participatory methodology, developed by a range of practitioners including Chambers (1994) and previously used by Caroline Moser in research on violence and insecurity, and on peace building (see Moser and Holland 1997; Moser and McIwaine, 1999; 2004; Moser, Acosta and Vasquez, 2006). In the World Bank, participatory methodologies are widely used, particularly for participatory poverty assessments. Rather than individual or household questionnaires, this methodology is based on the purposive sampling from the range of focus groups that are representative of community members by age, gender, ethnicity, economic activities and other culturally specific variables. The methodology includes transect walks to identify spatial vulnerabilities, timelines for community perceptions to changes in weather, community history matrices, institutional mapping, and severe weather impact matrices. Triangulation is an important aspect of the methodology to verify; compare and cross check results (see Moser and Stein 2010). The analysis of the data includes the quantification of focus group listings and rankings to provide a holistic understanding of perceptions at the community level (see Annex 1 for Guidelines for Conducting Bottom-up Urban Adaptation Appraisal).

b. Rapid Risk and Institutional Appraisal at the City Level (RRIA)

This appraisal was intended to identify the policy domain — the policies, programs and institutions that constrain or facilitate the adaptive capacity of the urban poor, as well as those that are instrumental in designing, implementing and monitoring pro-poor adaptation policies, or have the potential to do so in concrete urban contexts. It comprised an analysis of the institutional landscape, evaluation of relevant national, regional, municipal policies, regulations and mandates, and an evaluation of relevant programs and practice from the perspectives of the different-level stakeholders. The case studies identified 'top-down' interventions of external actors at local, city and national level such as municipal authorities, central government institutions, civil society organizations, and the private sector, working in poor vulnerable communities.

[9] Earlier theoretical work identified four stages (see Moser and Satterthwaite 2008; Moser 2009a). However fieldwork testing of the asset adaptation framework in this study revealed that local communities identified a three-fold 'before, during and after' framework in their perceptions of the cycle of severe weather.

c. Consultation and Validation of Results

A third and final stage to validate results was the consultation process which depended on the level of commitment by different social actors. In Estelí an action planning exercise was undertaken to triangulate the results. This participatory exercise allowed urban poor communities and public authorities together to articulate and identify common problems, define and structure strategies and solutions, reach consensus, and negotiate collaboration.[10] In Mombasa, where the research process generated less commitment from the local authorities, the post-research consultation process was limited to an information sharing and capacity building event attended by some eighty people, including a wide range of local representatives from the communities in which the research took place (such as chiefs, elders and other prominent community members), members of the Mombasa municipality, as well as other local governments, NGOs, national authorities, and members of the international donor community.

1.5. Selection of Case Studies and Research Process

This study is based on findings from Mombasa (Kenya) and Estelí (Nicaragua). The selection of sites was based on the following criteria: a) secondary cities where much of the anticipated growth in urban populations over the next 20 years will be concentrated, and yet are under-studied in the work carried out so far on climate change adaptation in urban centers, and; b) cities that do not fall into existing 'high-profile' categories for climate change impacts (sea level rise or storm surge) — leaving open the question as to the kinds of impacts currently being experienced in non-disaster contexts; c) cities that represent two continents (Africa and Latin America) where relatively less work is being done at present on urban vulnerability assessment (compared to East and South Asia on which the majority of recent urban adaptation research has focused — see Tanner et al. 2009; Rockefeller Foundation 2009; World Bank 2008; 2010a). Given the scale of this particular study, priority was given first to a southern African city — as an under researched area, and second, to Central America as an area that has long experienced extreme weather vulnerability. Finally, the selection of cities was influenced by the capacity to identify appropriate research partner institutions, which were committed to this study and also had close contacts with local public authorities, civil society organizations and local researchers. This was intended to ensure that the recommendations from the study might have a realistic potential for implementation within the capacity of the municipal authorities and other social institutions. The study was conducted in close collaboration with a local research institution and municipal authority in each of the two chosen urban centers.

Mombasa was identified as a growing and vulnerable urban center with low adaptive capacity resulting from limited financial resources, technology, institutional capacity, low levels of economic development and high poverty levels (Awuor, Orindi and Adwera 2008). As a secondary city, it is likely to experience increased urbanization. As a coastal city it is particularly at risk to flooding as a consequence of climate change. It has already suffered severe incidences of flooding e.g. from the Asian tsunami in 2006. The research was undertaken with Eco Build Africa Trust headed by Dr. Alfred Omenya, and Grace Lubaale, who coordinated the participatory community appraisal. In order to identify research communities, in a 'bottom-up' process, Grace Lubaale established contacts with local community-based organizations (CBOs) in Mombasa, explained the objectives of the research and sought their interest in the study. Four of the CBOs, Licodep, Alishe Trust, CODETI and CRF, agreed to participate in the four neighborhoods in which they were based, providing local community researchers as well as facilities for training, daily report-back sessions, and final analysis. Under the research direction of Caroline Moser, Grace Lubaale and a team of eight local Mombasa researchers undertook the research in Bofu and Timbwani (both in Likoni district), Tudor and Ziwa La Ngombe (which included the area of Bombalulu).

[10] Such a process has already been recognized in Estelí, where for the last fifteen years, municipal investments in infrastructure and basic services (co-financed by a national program PRODEL) have been identified and approved by the municipality and urban poor communities through an action planning methodology known as 'participatory micro-planning'.

Estelí, a mid-sized urban centre in Nicaragua was identified as the Central American research site as it has experienced strong economic and urban growth for the past fifteen years. The city has suffered severe flooding provoked by hurricane Mitch in 1998, as well as increased seasonal intensity of both rains and drought. Here city selection was also driven strongly by the availability of a local research partner with the capacity to undertake this research. The Institute for Applied Research and Local Development (NITLAPAN) at the Central American University was the primary research partner with a team led by Ligia Gómez responsible for the PCCAA and the RRIA. In Estelí, the *Facultad Regional Multidisciplinaria* (FAREM) of the Autonomous University of Nicaragua provided nine local researchers and logistical support to NITLAPAN. Irene Vance, a social anthropologist with long-term expertise in participatory urban appraisals and local development, along with Alfredo Stein (University of Manchester-GURC), directed the research in Estelí. The selection of the communities was undertaken initially in a 'top-down' process led by the Mayor and his technical staff in consultations with NITLAPAN and Irene Vance. This started with an overview visit to different neighborhoods followed by an analysis of municipal data on their poverty, risk vulnerability and infrastructure levels. The research team together with the municipality then selected the following four neighborhoods as representative of those areas most at risk to severe weather: Miguel Alonso, Monte Sinai, Belen and 29 de Octubre. The Municipality of Estelí also provided support in co-organizing the RRIA institutional workshop and the action planning training seminar.

II. BOTTOM-UP REALITIES: IMPACTS OF CLIMATE CHANGE ON POOR COMMUNITIES IN MOMBASA AND ESTELI

2.1. Background and Community Characteristics

As described in the section above, the cities of Mombasa and Estelí were selected for this research as medium-sized but fast-growing urban centers in a flood and drought-prone region respectively. Mombasa is a coastal town, centered on Mombasa Island, but extending to the mainland. In contrast, Estelí is situated inland in the North Central highlands surrounded by forested mountains.

Mombasa is the second largest city in Kenya. The district of Mombasa has more than 700,000 recorded inhabitants. Its climate is hot and humid with average annual temperature of 26.4C and noon-time humidity level approximately 65 percent. The port of Mombasa is the largest in the East African region with economic significance not only for Kenya but also for Uganda, Rwanda, Sudan, Ethiopia and the Democratic Republic of Congo. The city of Mombasa lies between sea level and 45 meters above the sea level which makes it particularly vulnerable to flooding.

Estelí is located in the north-western part of Nicaragua — an area characterized by mountainous terrains and valleys with elevations ranging from 400 to 1,500 m. According to the 2005 census, the city of Estelí has 90,924 inhabitants, representing 80 percent of the total population of Estelí municipality. According to the risk maps generated as part of the national climate change strategy in Nicaragua, Estelí is most vulnerable to two natural hazards: flooding as the intensity of rainfall has increased and the river Estelí cuts across the city from northeast to southwest; and drought as it sits in a region of the country that has been most affected by the El Nino phenomenon in recent decades. Estelí is vulnerable to hurricanes, although less so than other parts of Nicaragua. Hurricane Mitch in October 1998 caused severe flooding in the city.

The eight communities chosen for this study all share a history of rural-urban migration, with the majority being established after spontaneous land invasions. Inadequate housing standards and basic infrastructure characterize all of the study communities, with many inhabitants constructing their homes from available scrap material. Most of the chosen communities are not legally recognized by their respective municipalities or are recognized, yet their residents lack legal titles on their homes. In the case of some neighborhoods e.g. Monte Sinai and 29 de Octubre in Estelí, the upper parts have been legally recognized by the municipality and are included in the city's urban plan, whereas the lower parts, treated as illegal annexes, have not. These 'annexes' are also situated in the most hazardous areas next to the Estelí river and along the banks of a natural ditch. Boxes 3 and 4 below summarize the basic characteristics of the eight research communities including their location, origin, legal status, population and housing features.

Box 3: Characteristics of the four study communities in Mombasa

Location: Timbwani and Bofu are both located on the mainland, south of Mombasa Island in the district of Likoni. The two communities are adjacent to one another on either side of the main road to Lunga Lunga on the the Kenya — Tanzania border; with Timbwani on the left side that includes the Kenya Ferry services office, while Bofu on the right side bordering the Indian Ocean. Tudor is situated on Mombasa Island and includes both high ground municipal housing as well as invasion settlements on the muddy slopes descending to the shore of the Tudor creek that leads into the Indian Ocean. Ziwa La Ngombe is to the north of the city on the periphery of Mombasa Island.

History: Timbwani, Bofu and Tudor were all established during the 1930's colonial period. Prior to 1997 Timbwani and Bofu were part of the then Likoni ward of the Municipality of Mombasa. During the second multiparty elections that year, the Kaya Bombo tribal clashes occurred when a local police station, the Likoni Ferry Police Post, was attacked by a group of raiders. Seven policemen were killed, and 44 guns and 5,000 rounds of ammunition were stolen. In the ensuing violence, homes and stalls of the local people were also attacked. Ethnic clashes across the coast province between 'coastal' and 'inland' ethnic groups left forty people dead and 120,000 displaced. Ziwa La Ngombe was originally a settler farm, with scattered housing on it, which was handed over to the municipality in 1986 — the year in which local elders claimed the community was founded.

Legal status: Although land tenure is a problem in all four communities, the land tenure situation is not uniform. In the four communities there are pockets of landlords, often absentee owners, with land titles even though this is highly contested by the current occupants. In Timbwani, during the 1992 conflicts, militia groups forcibly took land from government and private owners and then sold it on to others for profit. Across the way, households in Bofu are located on tribal lands which have not been subject to land tenure. In Ziwa La Ngombe the municipality has already promised to legalize the land of some residents, yet has still to do so. Finally, in Tudor some households rented municipal housing, while others squat illegally.

Population and housing: The informal status of study sites meant that uniform information for all four communities was not available. Elders in Bofu identified the community contained 3,500 inhabitants, most living in extended families. Ziwa La Ngombe had approximately 2,816 dwellings, which housed an ethnic mixture with most Kenyan tribes found in this community; the largest number were the Mijikendas, with Luos, Swahilis, Taitas, Akambas and Agikuyus also present. There was no information pertaining to the ethnic make-up of Timbwani, however this community comprised the seven villages of Timbwani, Misufini, Maweni, Manyatta, Mrima, Majengo Mapya and Likoni flats. Tudor comprised permanent municipal housing as well as the overflow communities, squatters and squatter-tenants living in temporary houses.

Origin: Most of the inhabitants of Bofu, Tudor and Timbwani migrated from other neighborhoods in Mombasa and some rural areas in the Coast Province and other parts of rural Kenya. The exception is Ziwa La Ngombe where most residents migrated from other provinces of Kenya, with a small proportion of inhabitants who were Caucasians and Indians.

Box 4: Characteristics of the four study communities in Estelí

Location: All four sites are located on the West side of the city: Miguel Alonso to the South-West, Belen and 29 de Octubre to the North-West. Monte Sinai, located two kilometers from the city centre, and 29 de Octubre are each divided into Upper and Lower sectors. Lower 29 de Octubre is situated along the riverbank of the Estelí River, and Lower Monte Sinai, along a natural gully, which divides it from Upper Sinai.

History: With the exception of Upper Monte Sinai, all the communities began as a result of land invasions in the 1990s. Miguel Alonso, and Upper 29 de Octubre, the oldest communities, were both established on private land, and grew rapidly from 1999 after Hurricane Mitch. In 2001 vacant land along the river bank was invaded to form the community Lower 29 de Octubre. Upper Monte Sinai is a planned neighborhood; land was donated to the municipality by an international NGO, in 2000. Four years later, the municipality divided the area into 144 plots, and 130 housing units were constructed with government subsidy.

Legal Status: Few of the residents in the four communities enjoy full title; even in the planned community, Upper Monte Sinai the residents have private sales documents as proof of ownership. In the older illegal settlements, Miguel Alonso land titles have been granted gradually over the years. Belen and Upper 29 de Octubre remain without titles but are recognized by the municipality and therefore some basic services have been installed. Lower Monte Sinai and Lower 29 de Octubre are not recognized by the local authorities, and lack almost all basic services.

Population and housing: Miguel Alonso is the largest community with 400 houses and 2,000 inhabitants. Belen, with 2500 inhabitants, comprised of 227 houses, has more overcrowded conditions. Upper 29 de Octubre has 200 families and the Lower part 73 families. Much of the housing in all four communities is constructed of scrap materials, wooden planks, and plastic and old zinc sheets. In the communities that are recognized by the municipality and have some basic services, progressive improvements are ongoing. 29 de Octubre and Miguel Alonso have streets where most of the houses are built in concrete block. In Upper Monte Sinai the houses are standard core units built by a constructor. Many of these remain unoccupied; some are for sale because families have not completed the units to make them habitable, and continue to rent, others have migrated to other places. The 56 houses in Lower Sinai, like those in Lower 29 de Octubre are the most precarious; temporary buildings erected on a steep slope along a natural gully, and along the river bank.

2.2. What Does Climate Data Say about Likely Impacts of Weather Changes on the Poor?

One of the biggest constraints of the study of climate change vulnerability is the uncertainty of climate projections that would enable authorities to estimate precisely the risks and various impacts at the city level. Where climate scenarios have been developed they focus on a larger area than an urban center (although recent initiatives have tested downscale models for selected coastal cities), and generally explore projections for a longer timeframe, e.g. for the years 2030, 2050 or 2080. Annex II reviews some of the available climate projection scenarios relevant to the areas of Estelí and Mombasa. Due to the general lack of downscaled climate information and the uncertainty associated with long-term scenario projections it is impossible to compare precisely community perceptions on the risks and impacts of weather change to scientifically-backed climate data.

Nevertheless, scientific information is available on weather shifts so far experienced in the two cities, making it possible to track the slow and incremental change in weather conditions which local populations face (the data being less localized for Estelí relative to Mombasa). Data from national meteorological agencies in Kenya and Nicaragua shows an increasing trend in temperature and decreasing trend in humidity in the regions of both Mombasa and Estelí for the past five decades. Climate information on the trends so far registered in Estelí and Mombasa is confirmed by the lived experience of communities described in sections 2.3–2.6. Thus, despite the insecurity of future projections there is a lot that can be learned from recent and present changes in weather events e.g. temperature, precipitation and wind speed and by the impacts these events are already having on lives and livelihoods of the urban poor.

Analysis of Kenya's Meteorological Department long term weather data showed that there was a *gradual increase in the mean temperatures* in Mombasa in all seasons (for a wet, hot and cold month) of the year during the past 50 years. This gradual temperature increase was accompanied by a *reduction in mean humidity*, indicating that the

city got drier in average. The patterns of rainfall were erratic for the same period. Data also showed a significant *increase in mean wind speeds*. Finally, there was reduction in the visibility all year round although this was attributed to a combination of factors: higher local pollution, reduction in ground cover, increase in wind speeds, and increase in particulate matter in the atmosphere. (See Tables 2, 3 and 4 below).

Table 2: Climate data for a wet month [April] in Mombasa, from 1957-2009

	[T] Mean Temp. (ºC)	[TM] Max. Temp (ºC)	[Tm] Min. Temp (ºC)	[SLP] Mean sea level pressure (mb)	[H] Mean humidity (%)	[PPT] Precipitation amount (mm)	[VV] Mean visibility (Km)	[V] Mean wind speed (Km/h)	[VM] Max. sustained wind speed (Km/h)
1957 APRIL	26.3	31.0	23.1	1010.9	82.3	0.00	36.2	10.1	23.4
1966 APRIL	27.1	30.2	24.3	1010.1	77.9	0.00	37.1	13.8	24.4
1977 APRIL	26.9	30.6	24.0	1009.9	80.3	94.24	38.9	16.6	29.8
1987 APRIL	28.4	32.2	24.7	1011.1	75.7	90.44	28.9	12.5	24.2
1997 APRIL	26.8	30.8	23.1	1011.0	83.1	161.3	19.9	11.0	22.4
2007 APRIL	27.9	31.8	24.2	1011.7	78.0	81.27	17.7	12.9	30.7
2009 APRIL	28.2	32.2	24.7	1011.8	75.2	55.12	16.8	16.3	33.4

Source: University of Manchester (GURC) based on Kenya's meteorology department climate data.

Table 3: Climate data for a cold month [July] in Mombasa, from 1957-2009

	[T] Mean Temp. (ºC)	[TM] Max. Temp (ºC)	[Tm] Min. Temp (ºC)	[SLP] Mean sea level pressure (mb)	[H] Mean humidity (%)	[PPT] Precipitation amount (mm)	[VV] Mean visibility (Km)	[V] Mean wind speed (Km/h)	[VM] Max. sustained wind speed (Km/h)
1959 JULY	23.0	27.0	20.3	1016.7	83.5	0.00	37.1	11.9	30.0
1966 JULY	23.8	26.7	21.3	1015.3	81.8	0.00	30.7	14.5	24.0
1979 JULY	23.6	27.9	20.4	1017.2	78.7	43.19	36.0	16.0	28.2
1989 JULY	23.6	27.5	20.3	1016.4	81.4	43.71	20.1	11.8	23.0
1999 JULY	23.9	27.2	19.9	1016.7	81.5	0.00	20.0	14.1	23.5
2009 JULY	24.5	28.3	21.1	1017.3	77.2	42.16	17.3	18.0	35.8

Source: University of Manchester (GURC) based on Kenya's meteorology department climate data.

Table 4: Climate data for a hot month [December] in Mombasa, from 1957-2009

	[T] Mean Temp. (ºC)	[TM] Max. Temp (ºC)	[Tm] Min. Temp (ºC)	[SLP] Mean sea level pressure (mb)	[H] Mean humidity (%)	[PPT] Precipitation amount (mm)	[VV] Mean visibility (Km)	[V] Mean wind speed (Km/h)	[VM] Max. sustained wind speed (Km/h)
1959 DEC	26.5	31.3	23.3	1011.1	79.8	0.00	34.7	9.2	27.4
1966 DEC	27.2	30.9	24.1	1008.6	75.2	0.00	31.8	15.3	24.6
1979 DEC	27.1	31.5	22.8	1011.3	78.5	43.18	35.8	11.3	23.4
1989 DEC	26.7	30.8	24.2	1010.7	82.8	111.51	24.4	8.8	19.3
1999 DEC	26.9	31.1	22.5	1011.5	80.8	61.73	18.9	8.6	22.4
2008 DEC	27.9	32.4	24.0	1010.9	73.6	19.82	17.5	14.7	30.5

Source: University of Manchester (GURC) based on Kenya's meteorology department climate data.

Similar and comparable information does not exist for the city of Estelí. However, weather data from meteorological stations located in different sites in Nicaragua, showed significant incremental changes occurring in both the mean minimum and the mean maximum temperatures for the country. From 1957 to 2002, the mean

minimum temperature in Nicaragua varied by 0.6°C: from an average 15.5°C in the decade 1957-1968, it rose to an average 16°C in the last decade of measurement 1993-2002. For the same decades Ocotal, a city located 68 km North from Estelí and with similar topographic conditions, reported an increase of 0.3°C in the mean minimum temperature, and 0.1°C in the mean maximum.[11]

Data for Ocotal also shows an increase in the variation of temperatures between the hottest and coldest months of the year, implying that the hot season got even hotter and the cold months — even colder. For example, for the month of May from 1961 to1970 the mean maximum temperature was 36.5°C and it rose to 39.0°C for the same month during 1991-2000. At the same time, the maximum temperatures for October fell from 34.5°C to 32.1°C between the same decades (see Table 5).

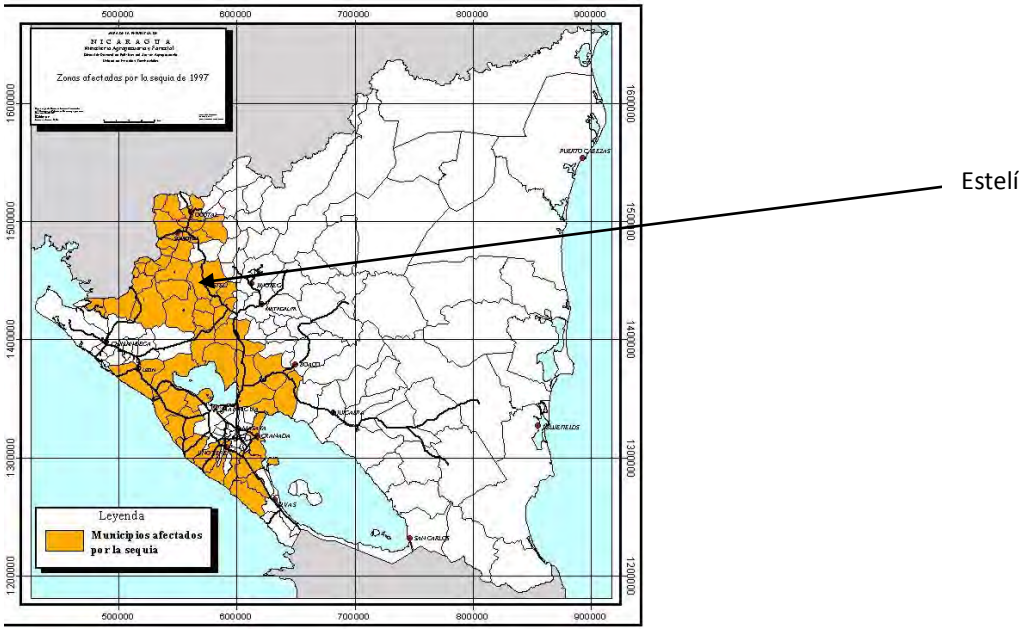
Table 5: Absolute maximum temperature (°C) per month per decade (1961-2000) in Ocotal, Nicaragua

	J	F	M	A	M	J	J	A	S	O	N	D
1961-1970	33	36.5	36.5	36.5	37	36.5	34.5	33.5	34.5	34.5	33.5	34.5
1971-1980	34	33.5	37.5	36.2	35.8	35	32	32.5	32.6	33.2	33.5	31.5
1981-1990	36.9	36.2	38.9	37.1	35.9	34.2	33.4	34	33	33.2	33.6	34.7
1991-2000	33.7	37.7	38.2	37.1	39	35.2	33.2	34.4	33.8	32.1	33.5	32.5

Source: Guerrero (2003)

Overall there has been a clear trend towards increasing temperature in all of Nicaragua (of 0.2°C per decade) which has also brought with itself changes in precipitation (UNDP 2007). Estelí is located in a region of Nicaragua that has been most affected by drought as a result of the El Niño phenomenon (see Figure 1).

Figure 1: Nicaraguan municipalities affected by drought (El Niño phenomenon)



Source: Geographic Information System, Ministry of Agriculture and Forests, Nicaragua

The data above demonstrates that there is already evidence of palpable shifts in weather conditions, experienced by urban residents. Climate data can also give some insight into the types of extreme events to which Mombasa

[11] University of Manchester (GURC) 2009 based on data by the Nicaraguan Institute of Territorial Studies (INETER)

and Estelí are exposed, even if the exact probability and intensity of their occurrence is unknown. Nicaragua has been repeatedly hit by hurricanes, including the case of Irene (1971), Fifi (1974), Joan (1988), and Mitch (1998). According to the Nicaraguan Institute for Territorial Studies it has also been repeatedly affected by the El Niño phenomenon associated with drought as in 1953, 1957, 1958, 1963, 1965, 1966, 1969, 1972, and 1982.[12] Mombasa is vulnerable to coastal flooding and storm surges and has recently experienced higher incidence of wind storms and cyclones. The Red Cross has also observed an increased incidence of fire in Mombasa, which may be related to rising wind speed. While this data has been taken into account in both states' disaster preparedness efforts, there has been less use of this information towards ongoing adaptation efforts.

Certainly, more research is necessary in order to prove the exact extent of ongoing, cyclical or future hazards faced by communities in Mombasa and Estelí. More research on the links between climate and environmental variables could also help to identify important relationships that contribute to the biophysical vulnerability of urban populations. For example, the links between coastal and coral reef erosion off the coast of Mombasa to expected physical, environmental and economic damage in the city are largely unknown. The effects, if any, of the El Niño phenomenon and prolonged drought in Estelí on the seasonal intensity of rainfalls in the city could also be examined further. At the same time, available data on temperature, precipitation and wind speed trends, confirmed by the lived experience of communities, presented in the sections below, gives reason to believe that residents of the two cities are already aware of and adapting to significant incremental shifts in weather conditions.

2.3 Community Perceptions of Increases in Severe Weather Conditions

Increases in the severity and intensity of adverse weather conditions are not necessarily dramatic 'shock' disaster stories. In many cities across the world, as illustrated by both Mombasa and Estelí, poor people living in slums and peripheral settlements experience the very slow incremental impacts of long-term trends in increasing severity of weather. Since this is more likely to be ignored, it is much more invidious. Therefore if climate is seen only through the lens of disaster, this presents a very partial picture and one that excludes, and fails to understand predominant patterns of weather changes and the sources of resilience of local communities. This is reflected in the terminology used in this study, as described in section 1.3 above. While the term 'extreme' weather relates to internationally recognized disaster events, 'severe' weather refers to events that are important to local communities even though they do not register as disasters with institutions responsible for disaster response at the country or international level. Thus in this study events that may be seen as disasters locally — such as houses being flooded or lost — are described in terms of 'severe weather'.

Box 5: Framing climate change in participatory research

Local residents in Estelí and Mombasa were not familiar with the term 'climate change'. Consequently this term was not used in the PCCAA. Similarly the term 'disaster' was avoided since researchers wanted to understand the slow incremental affects of changing weather variability.

In Mombasa focus groups directly discussed the issues of 'weather', once agreement had been reached as to its specific meaning in Kiswahili. In Estelí two Spanish words were used: *'Clima'* (climate) and *'Tiempo'* (associated with weather). Focus groups tended to identify phenomena such as flooding, heat etc. in terms of climate or weather so were asked Cómo *los esta afectando las lluvias* (How are the rains affecting you).

Climate projections for Kenya and Nicaragua, though not downscaled at the city level, suggest that the adverse weather trends, currently identified by communities in the two cities, will continue and will intensify in the future. Climate scenarios developed for Kenya and the East Africa agree that temperatures in the region are expected to increase (by 3.1-3.4°C according the AR4[13] A1B scenario). Nicaragua's Ministry of the Environment and Natural Resources

[12] Andrés and Rodríguez (Eds.) 2008. Citied in RRIA Report. Pérej, F. J., Lorio, G. M., and Vance, I. 2010. Diagnóstico Institucional Y De Riesgos A Nivel De La Ciudad De Estelí (RRIA). Page 15

[13] IPCC Fourth Assessment Report

estimated that by 2020-2029 temperatures in the country may increase by 0.5-1°C for the more optimistic scenarios (AR4, A1B) and up to 4-4.5°C in the more pessimistic scenarios (A2). IPCC findings also project a rise in the level of precipitation for East Africa. Increased rainfall, along with an even minimal sea level rise, would have a palpable impact on Mombasa's low-lying communities. Precipitation in all of Central America is projected to decline leading to longer and more frequent periods of drought, and potentially — to a higher intensity of rainfall during the rainy season (though further research is needed on the latter). Annex II presents more details on climate projections relevant to Mombasa and Estelí.

People in local communities in both Mombasa and Estelí despite their urban location and the fact that they did not conceptualize 'climate change' nevertheless had a great awareness of weather and its impacts on their lives (see Box 5). Listings and rankings from participatory focus groups in both cities showed similar perceptions of severe weather.[14] Rain and associated flooding was identified as the most serious problem in both Mombasa (49.8%) and in Estelí (69.8%), with heat/drought/sun of second importance, followed by winds — more evident in Mombasa than Estelí.[15] Coincidentally this concurs with the available climate data recorded for both cities. Perception data such as this shows the importance of not being constrained by the limitations of city-level climate science data when addressing different dimensions of resilience building.

Table 6: Composite matrix of perceptions of the most significant weather hazards in Mombasa and Estelí

Type of weather	Mombasa*		Estelí**	
	Ranking totals	%	Ranking totals	%
Flood/rain	166	49.8	312	69.8
Heat/sunny	105	31.4	116	25.8
Strong wind	55	16.4	20	4.4
Cold/chilly	8	2.4	-	-
Total	**334**	**100.0**	**448**	**100.0**

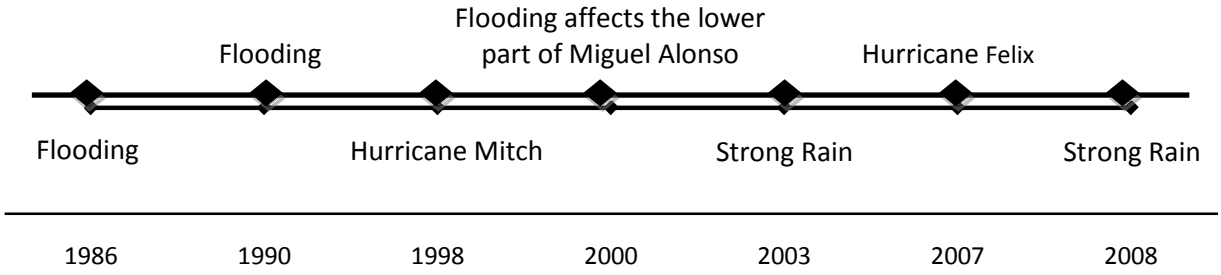
Sources: * Mombasa data from listing and rankings in 72 focus groups in four communities.
** Estelí data from listings and ranking in 62 focus groups in four communities.

A timeline from Estelí provided a longer term perspective, showing the way heavy flooding has been interspersed with hurricanes over the past twenty-two years.

Figure 2: Timeline showing the long-term perspective of weather in Miguel Alonso, Estelí

[14] In the PCCAA focus groups addressing each issue all used the same tools which allowed for the quantification of data by the number of focus groups. Table 6 shows the quantification of listings and rankings of weather. As prescribed by the participatory methodology (See Moser 2002) the numerical totals of all the ranking information (3 for first priority, 2 for second and 1 for third) were quantified. This data is only representative for the focus groups, but assists in showing the broader picture. For other examples of quantification of focus groups, see Moser and McIlwaine (2004). The same methodology is used for Tables 9 and 10.

[15] Some bias in the weather data reflected the fact that some of the tenants who, because they did not own their houses, did not care as much as did home owners. As a middle-aged woman from Bofu commented: *'Floods are not such a problem for me as I am a tenant'*



Source: Focus group in Miguel Alonso, Estelí

2.4 Vulnerability to Severe Weather in Mombasa and Estelí

Poor communities, such as those in Mombasa and Estelí, illustrate the vulnerability to severe weather conceptualized in the sections above. In both cities, households exist in spatially and physically vulnerable conditions. Located on marginal land, most households inhabit poorly constructed houses, with limited or no access to roads, clean water, drainage, waste collection services or electricity. Severe weather, therefore, exacerbates levels of vulnerability in conditions that already exist. Of the multiplicity of social, economic and physical vulnerability, three types stand out as being particularly crucial and pertinent if, as is likely, adverse weather conditions continue to increase.

Photo 1 Peripheral low-income settlement in Mombasa during rains

a. Physical vulnerability

The inadequate, or lack of, provision of three types of physical infrastructure, namely drainage, sewerage, and garbage collection, is problematic in itself. Nevertheless in the context of severe weather conditions particularly associated with increased precipitation, it is the interrelationship between the three that presents hazardous risks to health and well-being, affecting most frequently children, the elderly and infirm.

All the communities in the study lacked **adequate drainage,** which exacerbated flooding when the water could not drain away. In Mombasa efforts made to construct drainage when local government housing was built in Tudor in the 1930s, had long since ceased to support the increased population. As a result, when heavy rains blocked it, hazardous over-spilling into open drains and pathways occurred. In Estelí even in the planned neighborhood Monte Sinai, the lack of pluvial drains meant that domestic waste water from laundry washstands and self-built showers accumulated in the ditches. In three of the communities where households made informal drains into the street, unpaved streets and pathways became lagoons in the rainy season.

Photo 2 Open drains in Tudor, Mombasa

A more serious environmental health problem in communities in both cities was the **lack of sewerage systems**. Along with health hazards to which the population, especially children were exposed, the lack of sewerage limited

the capability of the population to protect human capital. In Mombasa, again in Tudor, the local authorities had put in a sewerage system, but it had not been maintained with leakages frequently occurring both in the area itself as well as down the hills to the illegal settlement of Moroto. Cholera outbreaks associated with water polluted by drainage seepage had occurred on a number of occasions — as Michael, a local community leader in Tudor complained:

"'There is lots of cholera and malaria here because of the lack of proper sewerage. They don't want to keep the place clean. But when the cholera comes you see even the big men here".

In both Mombasa and Estelí some communities had household or collective-level pits — that could overflow if not pumped out. An extreme solution in Mombasa was the so-called 'flying toilets' where people threw away feces in plastic bags. In Estelí community pit latrines were very rudimentary structures; a pit screened off by a cloth or plastic. Shared by several families, they filled up rapidly, and overflowed in the wet season. The soil type and the lack of any technical specifications to cope with the ground conditions exacerbated the problem with the sides of latrines caving in.

The **inadequate collection of garbage** or its dumping illegally on 'dumping sites' created particular health hazards across communities in both Mombasa and Estelí. These were exacerbated by rains when stagnant water could not move around uncollected garbage, attracting mosquitoes, which in turn increased the incidence of malaria. While some residents burned garbage or organized clear up days to clean out ditches before and during the rainy season, most recognized that flooding and unhealthy living conditions were due to the presence of waste. This critical garbage-mosquitoes-malaria nexus went way beyond being an infrastructural problem to one affecting the health and human capital of the local population, with children, pregnant women and the elderly particularly vulnerable (see Figure 3).

b. Politico-legal Vulnerability

Vulnerability deriving from varying degrees of insecurity of tenure rights to housing and land led to three main manifestations. First, was the **location on marginal land,** with the landless squatting on land that was highly vulnerable to climate variability. In Mombasa, settlements built on low land, such as areas of Bofu, or on reclaimed flood land or lakes, such as Ziwa la Ngombe, were likely to flood whenever it rained. In Estelí, similar flood-related vulnerability existed due to poor location. This included the lower sector, or 'annex', of 29 de Octubre where houses were built along the riverbank.[16] High risk areas also included housing built illegally in Kenya on what was termed 'repairing' land — hazardous land located on the edge of the sea/river, as in Moroto which regularly flooded with high tides, or on the sides of hills along sewerage exit pipes to sea as in Mburakenya, Tudor, where there were landslides. In Estelí, with the exception of Upper Monte Sinai all communities were illegal invasions on land designated as green areas. Within each some areas were particularly vulnerable; Lower Sinai, for instance, had rugged terrain, with steep slopes and a ravine which regularly flooded.

Lack of tenure rights was also frequently associated with a **lack of adequate settlement planning** and associated infrastructure provision. In Mombasa houses in some communities, particularly Ziwa la Ngombe, were built very close together without spaces for adequate roads or even pathways. In Estelí, hazards were exacerbated by the basic layout of roads, narrow passages and alleyways that provided minimal mobility and limited transport access. Lower Sinai and Lower 29 de Octubre could only be accessed on foot with houses built closely together preventing any meaningful adaptation to improve interior circulation. Even where services and infrastructure were available, such as in Miguel Alonso, and parts of 29 de Octubre, uneven land plots, together with the lack of pluvial drains, curbs and sidewalks caused flooding in solidly built properties.

[16] Prior to their settlement, the area was already recognized as prone to flooding. During Hurricane Mitch the river overflowed and changed its natural course, with the land illegally settled after Mitch; the 70 families living there were aware of the risk and had already been affected each rainy season with floods.

In Estelí, legal status had become a prerequisite of municipal authorities for the installation of services. However, this recent shift in position failed to recognize the incremental upgrading process that illegal land invasions had typically followed over a 10-20 year period during which community and household investments in housing and businesses were complemented by the provision of basic infrastructure. The latest planning regulations of the municipal authorities regarding security of tenure and access to services significantly increased the risk and vulnerabilities of these poorest neighborhoods. In Estelí, Miguel Alonso was the only one of the four communities that had been legally recognized (in 2000). Consequently, its residents had obtained some public services of value for mitigating the negative effects of deteriorating weather trends: electricity, potable water, garbage collection, some infrastructure, curbs and guttering, and bridges.

Summarizing the situation in lower 29 de Octubre, Meyling, a 19 year old girl said:

"In the whole neighborhood there is only one paved street. In this sector the houses don't have piped water, much less sewerage; we get water from one standpipe which is located in the yard of the coordinator. Some of us have electricity, there´s a light bulb here and there, that´s because our neighbors allow us to make illegal connections."

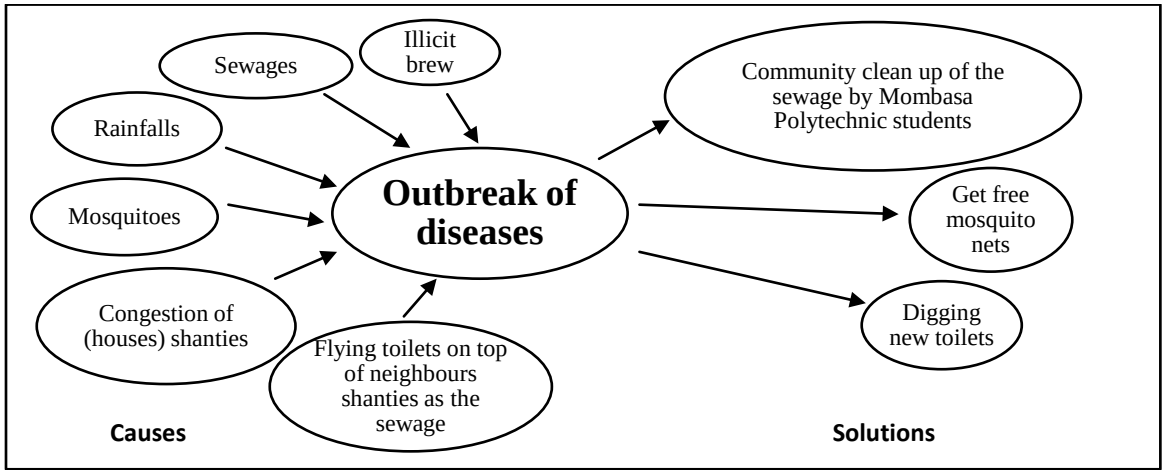
Photo 3 Squatter self-built housing in Estelí

A resident from Lower Sinai told of a similar situation:
"Here the only street is the ditch. We have electric light because our neighbors allow us to hook up illegally. ENACAL, the water company, recently installed a public standpipe, which has to cover the needs of the whole community. Previously we had to go to our neighbors' and bring water, for drinking, bathing and washing" Rosibel, Lower Monte Sinai.

In Mombasa, when inhabitants built communities by occupying government or privately owned land, the municipality did not recognize them as legal land owners. Even in Ziwa La Ngombe where the government issued three thousand allotment letters to the inhabitants in 1998, title deeds had not been distributed by 2009.[17] As most of the inhabitants of the four study communities had insecure tenure rights they were discriminated against in the provision of services and during severe weather, threatening their adaptive capacities. Figure 3, drawn by nine village elders in Tudor community, Mombasa identifies the relationship between the outbreak of diseases and inadequacies in both physical infrastructure and urban planning, with solutions including digging new toilets and the supply of free mosquito nets.

[17] In the current legal and policy framework, three categories of land ownership exist in Mombasa. These are the Government land or Public land, Trust land, and Private land. Government/Public land is reserved for the government's use, and Trust land is administered by Local Authorities under freehold title in the name of the Local Authorities. Private land includes all land held on freehold or leasehold tenure by members of the public. In Mombasa, forty percent of the land available is Government/Public land. Private and Trust land is 35 percent and twenty-five percent respectively.

Figure 3: Perceptions of the causes of the outbreak of diseases and potential solutions in Tudor, Mombasa

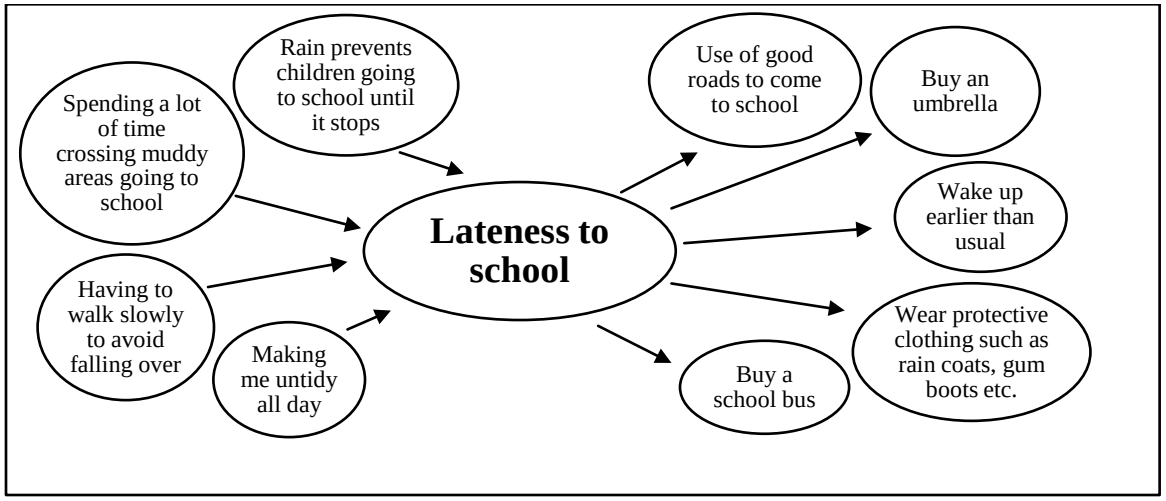


Source: 9 village elders; 3 women, and 6 men in Tudor, Mombasa.

c. Socio-economic vulnerability

Socio-economic vulnerability captures the fact that different groups (according to age, gender, disability or other forms of social difference, e.g. immigrant status) have different levels of vulnerability to specific weather manifestations.

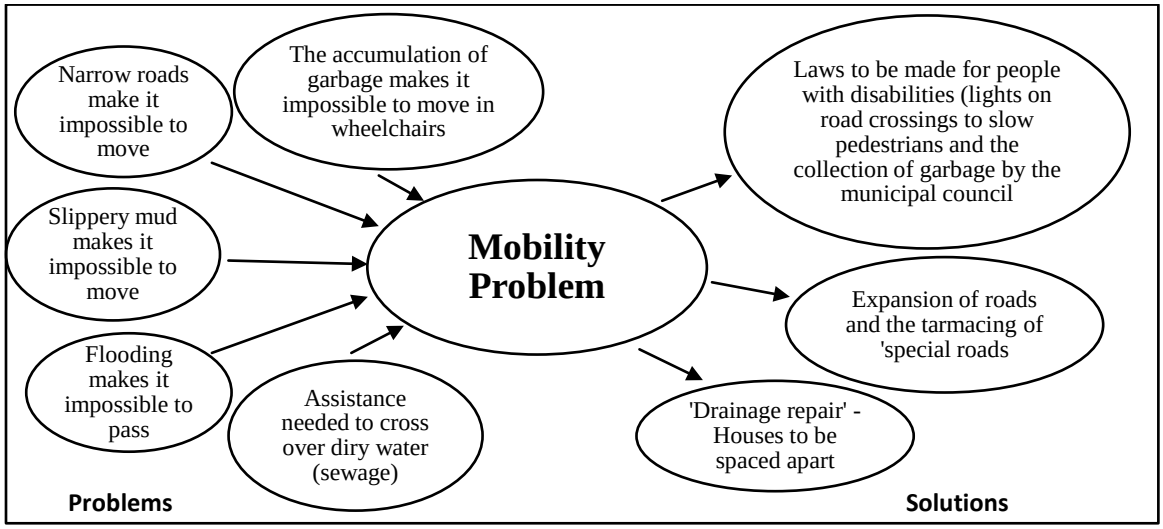
Figure 4: Perceptions of causes of lateness to school and potential solutions in Timbwani, Mombasa



Source: 7 pupils: 4 boys, 3 women, Maji Safi Primary School in Timbwani, Mombasa.

In Mombasa, children were particularly affected by the negative impacts of changing weather patterns; a focus group of school children in Timbwani, for instance, identified that the rains affected their ability to get to school on time, with a loss of learning time. As illustrated in Figure 4 they also identified practical solutions to this problem. Another group particularly vulnerable to rains and associated flooding were people with a disability (PWD). A causal flow diagram of PWD in Ziwa La Ngombe (see figure 5) showed how it affected their mobility and again identified potential ways in which this could be addressed.

Figure 5: Causal flow diagram on mobility for disabled people in Ziwa la Ngombe, Mombasa



Source: 5 women and 1 man, aged 33-48 years in Ziwa la Ngombe, Mombasa.

In Estelí, in addition to the physical risk and potential loss of possessions, caused by flooding, focus groups identified emotional stress and a sense of helplessness from being trapped indoors as well as difficulties in getting out to buy essential supplies. Residents in most communities mentioned the problems of insecurity because of the presence of youth gangs. While this was a general social problem not specific to weather, nevertheless families recognized that their capacity to deal with severe weather was weakened by social disintegration. Areas prone to flooding, without footbridges, or narrow passages, which lack street lighting were considered at greater risk especially for women and girls.

A third, less obvious group, in both cities was small scale local business men and women. In Estelí, rain damage to perishable stock and equipment was a particular concern, while in Mombasa, micro-businesses, such as tailors were more affected by wind (Ziwa la Ngombe), while carpenters were affected by the heat stress (Bofu). In addition, winds had had very serious impacts on housing as an asset (as well as loss of life) with bamboo roofs quickly catching fire (identified in Bofu and Ziwa la Ngombe).

As this section highlights, local residents in both Mombasa and Estelí experienced different types of vulnerability relating to their poverty, physical location and exclusion from most basic services. Severe weather in turn exacerbated such vulnerability. It was therefore important to differentiate between the ongoing vulnerability of the poor, its exacerbation by severe weather, and vulnerability that was weather specific.

2.5 Sources of Resilience: Asset-based Adaptation Strategies

'Are you asking me if I talk to God and ask him when the flood is coming?'
45 year old woman in Bofu, Mombasa

By looking at the ways in which poor households and communities are dealing with changes in weather we can understand the significance of what they are already doing — even if it is not immediately visible. Indeed, when first asked what they did about severe weather, many local residents in both Estelí and Mombasa did not automatically identify themselves as proactively responding, as illustrated by the above comment. Members of CBOs, local government officials and some researchers tended to reinforce this position.

However, as the quantification of actions, identified in asset-based adaptation matrices as Table 7 below shows, the results of the participatory appraisal revealed a very different picture; households, local small-scale business owners and community organizations were all involved in an extensive range of activities directly relating to

weather variability.[18] Therefore it is clear that we will not understand the impacts of change in severe weather, associated with climate change, unless we talk to the poor, and include them in decision making around appropriate actions to proactively support resilience strategies.

Table 7: Focus group matrices identifying asset actions before, during and after severe weather at household, small business and community level in Mombasa

Focus groups from four communities	Number of assets adaptation matrices	Actions relating to severe weather (in numbers and %)							
		Before		During		After		Average	
Household adaptation	23	21	91.0%	23	100.0%	21	91.0%	22	94.0%
Small business adaptation	16	15	94.0%	15	94.0%	14	88.0%	15	92.0%
Community group adaptation	32	25	78.0%	25	78.0%	27	84.0%	26	80.0%
Total	71	62	87.6 %	64	90.6	62	87.6%	63	88.6 %

Source: Asset-based adaptation matrices from 68 household, 72 small business and 72 community focus groups undertaken in four communities in Mombasa, Kenya.

In Mombasa the data was disaggregated to distinguish among adaptation strategies designed to strengthen sources of resilience, those implemented during the period of acute weather, and finally those designed to address rebuilding after the particular acute weather condition had abated. Why was there a discrepancy in perception between assumed and actual responses? Most probably this relates to the fact these were not highly visible, large scale interventions; rather they were a range of small, modest, incremental activities designed to build resilience against, or respond to, the onset of increasingly recurrent patterns of severe weather.

In Mombasa the majority (88.6%) of households, small business and community groups were resourceful at developing a range of resilience measures. Yet within the community there were also slight differences among different groups. Households responded more often than other groups (94%), with the greatest number of activities (90.6%) occurring during severe weather itself. In Estelí, local focus groups saw their initiatives to adapt to climate change as continuous, rather than time bound, before, during or after a severe weather event. Yet, as in Mombasa, households, small businesses and community groups were all taking adaptation measures to respond to severe weather.

Another finding relates to the assets that households, small-scale business and communities considered the most important in terms of building resilience, protecting or rebuilding. In Mombasa, the totals taken from asset listings and rankings, shows that housing, followed by health, was the most highly prioritized asset, whether owned by individual households or by business owners (see Table 8).

Table 8: Composite matrix of important assets in the four study communities in Mombasa

Category of asset-based adaptation	Asset ranking								
	First	%	Second	%	Third	%	Fourth	%	Total%
Household	House	38	Health	14	Children	9	Others	39	100
Business	Stock*	23	Machinery*	17	Health	14	Others	46	100
Collective[19]	Wells/Latrines	27	Health/Hospital	18	School/Education	17	Others	38	100

* Includes: Stock itself, source of stock, various materials such as wood etc.

[18] The quantification is derived from all the focus group asset adaptation matrices in each community, and a count of whether or not there was an asset action before, during or after severe weather in Mombasa (see Table 8).

[19] The term 'collective' refers to assets identified by local groups as of importance at a collective community level rather than just for individual households. This does not mean that they were identified by the totality of the community but rather by range of focus groups that in totality were representative of the community

** Includes: Sewing machines, fishing gear and handcarts.
Source: Based on fieldwork data gathered from four communities in Mombasa, Kenya.

While the Estelí data showed a wider range of priorities, housing and health were also both important along with local business and stock (see table 9).

Table 9: Composite matrix of important assets in the four study communities in Estelí

Category of asset-based adaptation	Asset ranking										Total %
	First	%	Second	%	Third	%	Fourth	%	Fifth	%	
Household	Housing	29.5	Business	7.5	Electrical Appliances	4.5	People	4	Others	54.5	100
Business	Stock*	13	Equipment**	13	Housing	13.0	Health	13	Others	48.0	100
Collective	Potable water/ Housing	10 each	Small businesses/ Natural resources	10 each	Social networks/ Electricity	10 each	Church	10	Others	30.0	100

*Includes: Stock itself, source of stock, various materials such as wood etc.
** Includes: Furnaces and electrical appliances.
Source: Based on fieldwork data gathered from four communities in Estelí, Nicaragua.

a. Household asset-based adaptation to severe weather

Household asset portfolios

Turning to asset adaptation at the disaggregated data, at household level, assets were suggestive indicators of well-being or poverty (see Moser 2009). In both Mombasa and Estelí most households listed few basic assets. A compilation of tenants' asset listings in the four Mombasa communities, for instance, illustrated the range across communities (see table 10). The very modest level of assets, listed in Bofu suggested that this community was particularly poor.

Table 10: Tenants' perceptions of important household assets in the four study communities in Mombasa

Timbwani	Bofu	Ziwa La Ngombe	Tudor
• Housing • Health • Security of children • Household goods • Consumer durables • Livestock[20] • Human skills	• House • Beds • Well (water) • TV • Kiosk • Teacher • Cell phone • Radio • Income	• House • Health • Electronics • Sofa sets • Furniture • Food stock • Jikos[21] • Utensils	• Housing • Health • Household goods • Consumer durables • Toilets • Livestock • Wells

Source: Analysis of tenants' focus group listings in the four study communities in Mombasa.

Again in Estelí there were significant differences in the ownership of household assets, between and within communities, associated with lack of income and poverty levels. The following comment elicited by Rosibel, leader and founder of Lower Sinai, is indicative of this:
"*The majority of our houses are built with planks, pieces of zinc, and plastic. We don´t have money and we have no help from anyone to improve them how we would like.*"
Juanita, from Belen community in turn remarked,

[20] This includes chickens, ducks and in some cases goats.
[21] Kiswahili term for charcoal stove used for cooking.

"*For some time now I have wanted to buy a fan, because of this heat; but how to get the 400 pesos that it costs, you have to work a lot and other days not eat."*

Households in Lower Sinai, and along the riverbank in 29 de Octubre, had notably less household assets, such as appliances and furniture, than did households in other areas. Women focus groups indicated that their lack of access to credit limited their possibilities to acquire basic household goods, as Martha, a community leader indicated:
"I live along the river, because I have nowhere else to go, I had loans before, and it went well, but now they don´t give us loans because they say that we could lose everything if the river floods."

In addition to a lack of resources, the limited investment in household assets sometimes related to the perception of physical risk. As Juan Paola from Lower 29th October in Estelí commented: *"It's not worth it; buying things for the house,...imagine trying to get out of here when it floods, and in the dark, with no electricity"* Juana Paola, Lower 29th October.

Table 11: Focus group listing of key household assets in the four communities in Estelí

Upper Monte Sinai	**Upper and Central 29 de Octubre**	**Belen**	**Miguel Alonso**
• Housing • Home Business • Human skills • Pots, pans and crockery • Electrical Appliances • Household goods • Ovens	• House • Health • Businesses • Human resources • Work • Food • Income	• House • Health • Latrines • Crops • Businesses • Electrical Appliances • Animals • Family	• Housing • Electrical Appliances • Ovens • Animals • Furniture • Cash • Latrines
Lower Monte Sinai	**Lower 29 de Octubre**		
• Housing • Cash • Children • Work • Crops	• Houses • Health • River • Household goods • Crops		

Source: Focus groups in four communities, Estelí.

Housing as the most important asset

All household owners and some tenants prioritized housing as their most important asset in both Mombasa and Estelí, and all had developed strategies for enhancing resilience related to housing, depending on tenure rights. In Mombasa, for instance, differentiation in ownership between de facto and de jure house ownership was historically linked to differences including the following:

- Households living on *tribal land*, such as in Bofu,
- Households living as '*professional squatters'* on land forcibly taken from government or private owners by militia groups, who then sold it to on to others, such as in Timbwani,
- House owners on *government land*, such as in Ziwa la Ngombe, who had been promised but not given titles, so informal titles were seen as legal tenure.

In some communities there were also squatters; in Tudor, for instance, squatters had invaded 'repairing' land that the local municipality had designated as important for the protection of mangroves. Many home-owners rented rooms to tenants, and again there were variations about letting arrangements between different settlements. In

Timbwani whole houses were rented by absent owners from local coastal 'native' tribes to upland incomers many of whom had fled because of election-related political conflicts. By contrast in Ziwa la Ngombe, homeowners were more present, letting out rooms in the houses they themselves lived in.

Housing was generally clearly identified as a household asset, except in those cases where municipal-housing tenants had undertaken collective repairs. For instance, in the Tudor Estate in Mombasa, long-term tenants lived alongside sub-tenants renting by the room in the houses of others.[22] In the case of community leader Mary, three people rented a room in her flat and paid 475 shillings per week, while sharing the living room, kitchen, and bathroom. For them collective responses from all the renters were essential. As she recounted:
'When the roof leaks we the tenants have to collaborate together to get it repaired as the council does nothing; similarly when the sewerage disposal blocks up we have to hire someone to come and unblock it. We all have to chip in and pay'.

Table 12: Adaptation strategies applied by tenants and owner occupiers during rains/floods in Mombasa

Asset Holder	Strategies		
	Before	**During**	**After**
Tenants	• Repair roof • Build strong foundations • Dig trenches around the houses • Clear drainage	• Seal leaking areas • Vacate flooding houses • Open up water passage routes	• Block water passage routes • Repair houses
Owner occupiers	• Make water drains • Repair houses • Build concrete skirting around the houses • Pile sands around the houses • Seal holes/leakages • Build barriers at entrances to houses • Build strong houses	• Unblock/clear drains • Mover to safer houses • Remove water from house	• Rebuilding and repairs

Source: Focus group discussions with owner occupiers and tenants in four communities, Mombasa.

Households identified a range of adaptation strategies to build resilience against severe weather, particularly flooding. Generally these were modest in scope and incremental in nature, with differences between owner and tenants, as well as amongst owners depending on whether they lived in their houses as owner occupiers or were absentee owners renting out the house or individual rooms. Table 12 shows that in Mombasa generally owner occupiers allocated more resources to adaptation measures aimed at building resilience than did tenants or absentee owners. Owner occupiers reinforced the house structure before the rains; minimized the entry of water to their houses during the rains; and carried out repairs on the houses after the rains. This included re-building and/or strengthening the foundations and walls for the houses. According to tenants, absentee owners generally did not take much responsibility to adapt their rental houses to excessive rains and floods. At the same time tenants were less likely to implement adaption strategies themselves. Often their contribution was aimed simply at ensuring that the house could be lived in for a little while longer.

[22] Tudor provides a fascinating case study of community level struggle around housing. The rental housing estate was originally built by the municipality under colonial government in 1930s. When the original renters came 'even the showers functioned'. Originally there was piped water, then rationing and now no water – so the inhabitants buy it by jerry cans. The services stopped in 1992 and again in 1997 even though rents are still collected. This is when people started their tenant's association.

In Estelí adaptation strategies relating to housing were heavily influenced by insecurity of tenure. For example, in Lower Sinai, and Lower 29 de Octubre there was a prevailing perception among residents that at any time they could be forced to leave the neighborhood as the following comment illustrates:
"*I haven´t done much to improve my house with concrete blocks because they are very expensive, but also nobody is going to spend much where we are not sure if we can stay or have something to pass onto our children*" R.M., 44 resident of Lower 29 de Octubre.

Photo 4 Household adaptation in Estelí

Despite several years of negotiation, the local authorities and utility companies refused to give assurances of the right to remain, and to the installation of basic services. Although, in both these sectors, some families were renting from the illegal owners; there was little difference in the housing quality of "owners" and tenants. The concept of before, during and after severe weather events was less clearly recognized than in Mombasa. As Juana, a resident in Barrio Belen said "*every year we have to cope with the rainy season, when there is a heavy shower we have to get going, digging ditches, if not our possessions would get damaged"*. Resilience measures to resist changeable, intense weather conditions were implemented on a continual basis through small actions. These included covering things with plastic, packing valuables in plastic containers, moving furniture, and in some cases dismantling and rebuilding the temporary houses and/or moving latrines to different locations on the plot, or within the same neighborhood.

Families along the riverbank in Lower 29 de Octubre in Estelí, had a simple early warning system in place, and had invested time and labor in building a stone dyke along the river. As Victor Ramon, a community leader, indicated:
"We have built a wall along the river at the places where there is greater danger of flooding. We clean the rubbish out of the river and dredge out the silt and sand. We have a simple early warning system; we place stones as markers to measure water level, and we have a surveillance post in the houses on the riverbank, when we think there is a risk of flooding we give the alert to evacuate."

Table 13: Adaptation strategies to protect housing in Estelí

Household Asset	Before/Continuous	During	After
Plots or sites	• Level the land • Build terraces • Plant local trees • Dig trenches • Build drainage channels	• Spread dry soil/gravel • Build stone dykes • Dig trenches around plots • Open up drainage passages	• Plant damp resistant trees • Replace eroded ground with new soil/stones • Build stones dykes • Repair fences • Replant trees and plants
Houses	• Clean ditches • Replace plastic/zinc • Replace wooden planks • Build stone dykes • Reinforce foundations • Build steps with tires	• Block leaks • Collect leakages • Secure zinc roofs with stones • Spread sawdust • Dig drainage ditches	• Repair leaks • Mend roofs • Reinforce foundations • Maintain drainage ditches
Latrines, Showers and Washstands	• Build and maintain • Abandon/eliminate saturated latrines • Improve absorbency with tires • Tie down and secure	• Dig ditches • Channel water away from houses	• Repair structure • Replace poles and plastic • Reinforce with tires • Dig new holes •

Source: Focus groups in four communities, Estelí.

Protecting human capital

In both Mombasa and Estelí protecting health was the second most important priority for building climate resilience, with the impact of severe weather widely recognized. In both cities, poor living conditions were exacerbated by heavy rains/flooding and heat. The main diseases were vector borne; stagnant pools and waste water channels were ideal breeding grounds for mosquitoes. In Estelí, malaria and dengue were prevalent. Belen was considered to have the highest incidence, as well as the worst sanitation-related health problems. Women mentioned the health risks from rats at all times of the years, but increasing when the drains were full of rubbish, during and after heavy rains. They combated the rats by putting down poison. Cases of leptospirosis were also identified.

In Mombasa again, malaria was a recurring problem even though identified by many as "contained". This implied people knew how to respond to it, with drugs available at the hospital. The biggest constraint was a financial one as a young mother in Ziwa la Ngombe explained:

"The last time my child had malaria she was in the public hospital for five days and it cost me 400 shillings. Then when I got it I went daily to the private hospital to get the drugs for five days and it cost me 500 shillings."

Among children, water borne diseases, diarrhea, and respiratory diseases were more prevalent during the rainy season. The main actions were community clean up days, where the residents collectively cleared rubbish, unblocked the storm drains, or filled in pools of stagnant water. There were no health centers within any of the four communities, although people did attend clinics in the vicinity. However, women said that due to the lack of resources they could not always afford the costs of medication.

The importance of both urban and rural social capital networks

Social networks and family ties were important to protect human capital during emergencies, particularly when people were forced to leave their homes to protect their lives. In 2004 in Belen, Estelí, for instance, the footbridge collapsed, the barrio was cut off and children took refuge in a church, while others stayed with friends or relatives in other neighborhoods. In 29 de Octubre, families were evacuated for five days in the nearby school. Focus groups mentioned support from a few charitable citizens who had provided basic needs, food, water and

household utensils. The police protected the houses during their absence. This mutual help between neighbors, relatives and friends strengthens resilience.

In Mombasa the strong linkages between urban households with rural extended families means that drought and food security issues have indirect impacts on financial capital. While the study did not specifically focus on rural-urban linkages, nevertheless anecdotal information revealed the importance of extended family networks. Mary, a long-time community leader in Tudor, for instance, explained that she still retained strong links to the rural area where her father had been a member of the Mau Mau in the 1960s.[23] Her grandparents, mother and three siblings still lived in the family home, some eight hours beyond Nairobi by public transport. Mary went around 3 times a year, taking cash. *'They want you to give something so they can feel happy'.* In return she brought back yams, sugar cane, potatoes, and cabbages. However while the study was being undertaken there was serious drought in the rural area where her family lived, with no rain, no food and cows dying. In a situation of 'dirt struggle', she sent money to the local rural shop to supply her family with food, or they would be *'left to God'.*

The strength of urban-rural household linkages meant that severe weather in rural areas could have impacts on urban household and small business financial assets. For instance, when food prices went up in rural areas, because of crop shortages due to drought, extended family members in urban areas sent more cash. Sometimes daughters and sons in urban areas would alert the urban base of welfare social protection NGOs, such as Bilal Muslim Mission, about the condition of their rural families to request them to send food aid. Urban families were also expected to help protect the human capital of rural families members, sent to live with the extended urban family — thus reducing the number of mouths to feed. However, rural price increases could also affect urban areas. The Red Cross identified that they were registering urban people for drought, when urban farmers in peri-urban areas could no longer grow crops.

In Estelí political conflict and the length of urban residence had reduced the strength of urban-rural linkages. Civil war in the 80´s and 90´s, as well as in 1998 after Hurricane Mitch, had resulted in rural-urban migration, with older people in focus groups describing how they had fled their farms, ties were severed, and their adult children were urban dwellers. Most families had lived in several neighborhoods prior to finding their own plot, even if they still did not have legal title. Nevertheless, some, particularly women, considered that living in the urban areas had eroded their assets, and their resilience to cope with severe weather conditions had been weakened. Maria Dora Gurdian, 64 years old originally from Quilali, said:
"Life in the countryside was better, I had everything, land, crops, fruit trees, water, and wood fuel was free. Here I sell wood fuel, sometimes I don´t sell a stick in a day."

b. Small business asset-based adaptation to severe weather

In both Estelí and Mombasa a wide range of local people ran small businesses.[24] In Mombasa these included hawkers, water vendors, *boda boda* (cyclists) and *tuk tuk* (tricycles) operators, vegetable sellers, carpenters, fishmongers, micro-finance groups and women's' groups. In Estelí focus groups identified different business activities: first were the small home based enterprises that tended to have very few fixed assets, and sold basics for daily consumption; second, larger productive enterprises, carpenter, saddler, and mechanic shops that had separate business premises generally located in more consolidated areas, and less likely to be affected by floods; third, street vendors, (tortillas, vegetables, washerwomen).[25] Despite the diversity of small businesses, important

[23] The complexity of tribal identity was such that long term residents in Mombasa often still identified themselves as 'visitors'. As Mary, who had lived there 20 years commented, *This is how I am seen by Mombasa tribes. When I go home I am in my country: there the Mijikenda tribe is the majority".* Such linkages were also reinforced when rural land was distributed to urban family members. Mary's neighbor was proud that her father gave her land, along with his three sons. Her father had not given land to her two sisters. Because they were both married *'so they are OK',* unlike Elizabeth who is divorced.

[24] The small business category was defined as including all those involved in small scale, micro-level production or sale of goods and services. Focus groups were conducted at their place of work whether it be on the road (such as tuk-tuk drivers), in local markets or in their workshops (such as carpenters).

[25] In addition were the salaried workers with tobacco factories were one of the main sources of male and female employment, as well as construction and day laborers on farms.

assets were similar across enterprise type and community. In Mombasa, the most important assets identified, as quantified in 72 focus groups, was first and foremost their stock, then their machinery and third their health (see Annex IV, Table 4.1), while in Estelí the three main items were again stock and equipment, followed by trade/sales, and customers (see Annex IV, Table 4.2).

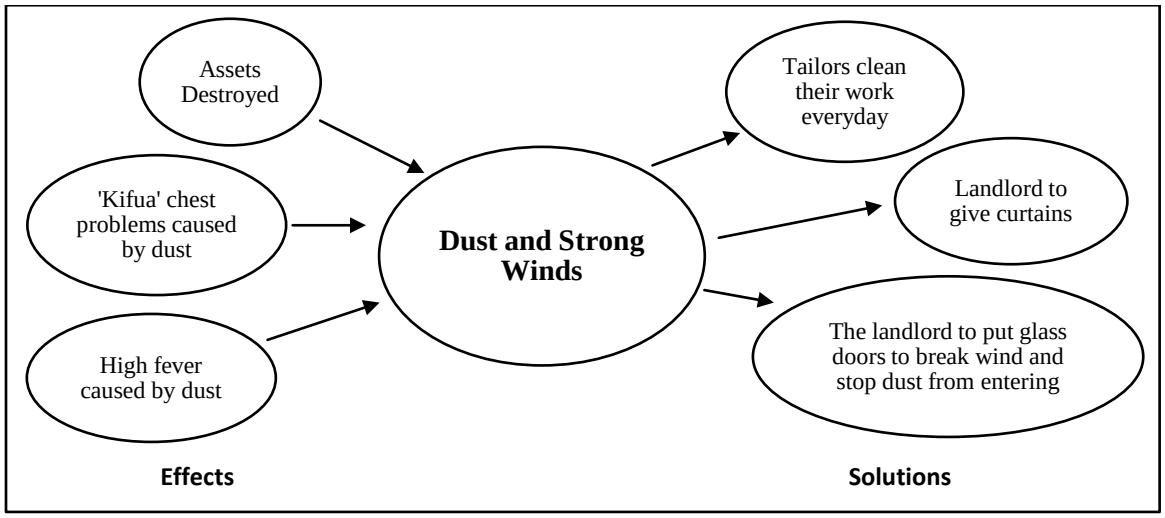
Photo 5 Protection of a local business against floods using a wall in Mombasa

Small businesses had a diversity of adaptation strategies, generally modest and small scale. In Mombasa, 92 percent of small businesses undertook some action to address severe weather with slightly more of their interventions occurring either before or during such occurrences (see Annex IV, Table 4.3). Small businesses, even more than households and communities, were affected by all three types of severe weather, namely rains/floods, heat/drought and winds.

In Estelí, strategies to protect small enterprise business assets were similar to those to protect household goods: maintaining limited stock, unplugging electric equipment and protecting produce by covering it with plastic, or storing it in containers. The range of perishable goods on offer was reduced, while costs of keeping dairy produce cold (milk, cheese and drinks) increased. Supplies were more expensive during rains, when wholesalers did not make deliveries, so shop owners bore the extra costs. Larger stores that had greater liquidity bought in extra stock prior to the rainy season, anticipating scarcities; smaller stores tended to reduce stock.

In Mombasa, dust caused by strong wind, had important effects on small business assets. In Maweni settlement in Ziwa La Ngombe, for instance, young tailors identified how influenza related health problems made them unable to work; it also affected productive assets such as sewing machines which ceased to function if sand got inside them. In identifying adaption strategies, as renters they distinguished between their modest efforts to clean their sewing machines and the more permanent solutions that landlords could provide, such as introducing glass doors, that would enhance resilience (Figure 6).

Figure 6: Effects of and solutions to dust and strong winds in Ziwa la Ngombe, Mombasa



Source: 15 Tailors aged 20-35 years in Maweni, Ziwa La Ngombe.

Photo 6 Protection of a house against floods using sandbags in Mombasa

Regardless of enterprise type, adaptation measures were basic and temporary, undertaken on an individual rather than collective basis. Carpenters in Bofu, for instance, put sandbags in place to prevent water entering the premises; shopkeepers moved business assets to safer areas; and fishmongers ceased to sell fish and divested into other forms of business. Others cleared stock and tried to maintain customers even when there were floods, such as video shops.[26] Motorbike mechanics in Timbwani and Bofu ensured their motorbikes — even though rented — were properly stored before the onset of floods, checked that fuel tanks were correctly sealed during the rains, and rapidly overhauled and repaired their bikes once floods had ended so as to ensure they could rebuild their businesses. In Estelí, small business owners reported how it affected primary materials, tools and electrical appliances; timber stocks were affected by damp and were put out to dry continually. In periods of excessive rains, heat/drought electrical equipment was damaged by short circuits or peaks in voltage. Larger businesses could replace these items; smaller ones were less able to do so.

Strategies to rebuild after severe weather, geared towards reviving the business, faced obstacles in accessing credit and/or micro insurance. At the same time members of the business community identified a range of interventions that could assist them. These included weather forecasters informing people about upcoming severe weather occurrence, building houses on higher grounds, digging trenches, sewerage systems, and soak pits; establishing garbage collection points, and tree planting to reduce water flow and velocity. One interesting example of an enterprise-based collective focus was a youth business group, the South Coast Youth Group in Bofu, which assisted in evacuating community members in cases of severe weather-related floods.

A common strategy of large numbers of street vendors in the four Estelí communities was to carry out business outside the neighborhood. Washerwomen, vegetable and other informal sellers and service providers built up a secure number of such customers to protect them against weather related uncertainties. Another strategy was to buy and sell produce on the same day, selling of stock at cheaper prices, or using it for family consumption. Equipment, such as street carts, was stored outside the neighborhood on higher ground. Changing the type of products for sale was also a response to weather conditions; for instance, water sellers had better trade during heat waves. Sandra, from Belen, an ice-cream seller, and also a hairdresser said, "*It's better for me when it's hot, I sell more ice-cream; when it rains fewer people come to have their hair cut".*[27]

c. Collective Asset-based Adaptation to Severe Weather

The third level of asset-based adaptation strategies relates to collective assets. In both Estelí and Mombasa a range of focus groups identified a wide range of types of collective assets, as listed below for Mombasa. This shows both similarities and differences across communities; for instance, in Timbwani, dumping sites and quarries were identified as additional, important collective assets not prioritized in other areas.

[26] Local video shops, where customers came and viewed videos in the afternoon or evening were both popular and lucrative in the four settlements in Mombasa. Shop owners rented Tanzanian, Nigerian or South African videos, or bought them at 200 shillings per video, while customers paid 10 shillings to vie them.

[27] It is important to note that the economic situation of employed workers was also affected by severe weather. In Estelí during extreme weather conditions, salaried workers were laid off, demand for agricultural workers fell during droughts, while construction sector workers were affected by heavy rains. Masons worked longer hours in the dry season to compensate for the periods when work was scarce. Tobacco workers had more job security, although they also indicated that there have been layoffs.

Photo 7 Protection of a community well in Tudor, Mombasa

Collective action for asset-based adaptation at a community level was less widespread than individual household or small business adaptation, in part reflecting the fact that not all community groups were spatially based (some such as women's groups identified gender rather than collective community concerns as their primary focus). In Mombasa, for example, 80 percent of initiatives sought to build resilience, with more activities undertaken after, rather than before or during severe weather. Prioritized collective assets included specific structures such as wells, or institutions such as hospitals associated with health, and schooling linked to education (see Annex IV, Table 4.4). Collective adaptation strategies were also influenced by local perceptions relating to the responsibilities of local authorities and other institutions. In Mombasa the level of collective responses reflected a culture of institutional reliance, in which responsibility was generally perceived of as relating to an external institutional structure. Thus local strategies were more likely to be an immediate response after severe weather, such as removing children marooned in buildings, rather than those focused on building long-term resilience.

Nevertheless, one of the most important collective assets recognized as a collective responsibility was water wells. Constant maintenance was required to build resilience against contamination, exacerbated during periods of flooding when seepage from brackish water, or more seriously from sewerage often occurred. This has become increasingly problematic in all communities. One local NGO leader commented: *'I used to peer into the tank and I could drink it; but now the bore holes are not fit for consumption'.*

As a local leader in Tudor explained, to address this, pots of chlorine were supplied by the Ministry of Health with a local elder allocated the responsibility to identify wells and ensure the process was implemented. In Tudor, as in other communities, households around a water well used old tires to line and protect the well from contamination during rains and floods (see Photo 7). Communities often responded only when cholera outbreaks occurred, occurring when well water was contaminated by storm water and solid waste. In two communities Muslim religious leaders played an important role in the maintenance of wells (see next section).

Table 14: Strategies to adapt collective assets in Ziwa La Ngombe, Mombasa

Assets	Strategies Adopted		
	Before	**During**	**After**
Houses (Tenants living together in one house)	• Unite and seek assistance from donors, • Repair houses • Construct strong houses • Dig water passages • Dig drainage	• Go to safer places • Drain water from the houses and pray to God • Sleep on top of the house at the ceiling • Dig small water passages • Fill sacks with sand and arrange them to break water flow • Fill sand and stones on the paths	• Filling sand in bags and put them on paths • Dig drainage tunnels • Spread sand and stones • to the affected areas • Seek assistance from the same NGOs that they are working with
Water project (well)	• Work together with NGOs such as Action Aid Kenya to help in building resilience • Build strong walls of the project site • Renovate water chambers by raising its height	• Nothing is done	• Remove extra sand brought in by the flooding to avoid siltation
School	• Build strong walls in the different buildings	• Taking children to safer places as a form of rescue	• Children go back to school • Renovation of school buildings and asset affected

Source: Group of eleven members of a water project (aged 50-60yrs)

Other examples of collective action, again around water, came from water groups. For instance, the Ziwa la Ngombe Women's Water Project (BWWP), supported by a civil society organization, Action Aid International Kenya (AAIK), collectively responded to protect the wells, and implemented strategies to build resilience around housing and the local school (see table 14). In contrast, in Tudor, where even though the drains were identified as a community asset and posed a great health hazard to the people, there was no collective response at all; even from institutions.

In Estelí, across the four communities there were differences in the range of community assets (see Table 15). The main collective assets (streets, sewerage, street lighting, day care center, schools and churches) were found in neighborhoods founded in the 1990s, where legal recognition by local authorities meant some progress had been made in the provision of basic services. In contrast, the two spontaneous sectors Lower Sinai and Lower 29 de Octubre had virtually no community assets and hence collective adaptation was minimal. In both areas water supply was still a critical issue; one standpipe was the only source for the 68 families in 29 de Octubre, with three standpipes in Lower Sinai. In these sectors, latrines were considered collective assets, because half of the families had to share one facility as well as showers and washstands.

Table 15: Community assets in the four study communities in Estelí

Miguel Alonso	Upper 29th October	Upper Sinai	Belen
Streets	Streets	Streets	Streets
Sewage	Sewage	Windbreak	Ramps and Footbridges
Street Lights	Street Lights	Daycare Centre	Garbage collection
Cement bridges	Piped Water		Daycare centre
Daycare centre			
Churches	**Lower 29th October**	**Lower Sinai**	
	River	Pathways	
	Public Standpipe	Public Standpipes	
		Latrines	

Source: Focus groups in the four study communities, Estelí

Possibilities of enhancing resilience or increasing the number of collective assets had been limited, and in part because of weak community organization. Several factors contributed to this, including the fluidity of the local population; men constantly came and went, while some founder members had moved to other neighborhoods because of increasing youth gang-linked insecurity. In addition, recently new community organizational structures had been introduced by the political party in power. Focus group responses in all four communities revealed that this structure and election of new leaders had raised suspicion and created tensions. Some were not readily recognized as legitimate, and community cohesion has been further eroded.

Photo 8 Contention walls built by residents in the lower part of 29 de Octubre to protect against flooding

In the planned settlement of Upper Sinai, only about half of the houses were inhabited. As in Mombasa, this community created by the town council, suffered from a general lack of ownership of the main assets. The barrio had benefited mainly through donations[28], which had fostered a culture of dependency. This has been further compounded by dissatisfaction with the project and technical complaints about building quality. As Ruth, a leader, commented,

"When the houses were constructed the unity disappeared; houses weren´t finished, they were left without zinc, others without windows, doors left unpainted. That finished the unity. Now people think that every project means that they have come to rob us."

Finally it is important to note that in Estelí, unlike Mombasa, the past history of very extreme weather (such as hurricane Mitch) meant that the most vulnerable areas of each community had put in place systems of continual surveillance, during the rainy season, from April to October. Any slight change in weather patterns, called for a response and preparedness for possible evacuation.

2.6 The Role of Local Institutions in Adaptation to Weather Changes

Along with the small, incremental, and often imperceptible strategies of households, small businesses and community groups to build resilience against severe weather, it is important to identify the support provided by

[28] The land was purchased by an NGO from a private owner, and donated to the Town Council for needy single headed households. The Council sold the plots to families that met their criteria for US$ 400, and monthly repayments of US$ 7, but families were in arrears. Houses were constructed with a government subsidy by a contractor, who allegedly charged the beneficiaries for different construction items. The project was never completed; houses were left without roofs, window frames and doors. The latrines project had a similar fate; the same contractor was involved. Recently the Council was pressuring for repayments.

local institutions. These can range from informal associations to formal state and religious institutions. However, those identified as important in local communities did not necessarily assist them in building resilience or responding to severe weather.

Table 16: Listing of institutions in the four study communities in Mombasa, by general importance and in adapting to severe weather

Name of community	Institution	Important in community	Important in adapting to weather
Bofu	LICODEP	1[29] (10)	1 (15)
	Women's Group	2 (7)	
	CDF	3 (6)	2 (6)
	Schools	3 (6)	
	Church/Mosque		3 (4)
Ziwa la Ngombe	Schools	1 (8)	1 (18)
	Chief	1 (8)	
	Action Aid	2 (7)	2 (16)
	Women's groups	3 (6)	3 (14)
	Youth Group	3 (6)	
Timbwani	Hospital/health centre	1 (10)	1 (21)
	Schools	2 (9)	
	CDF	3 (8)	
	Chief	3 (8)	
	LICODEP		2 (20)
	Church/mosque		3 (16)
Tudor	Chief	1 (6)	1 (16)
	Elders	2 (5)	1 (16)
	Women's Group	2 (5)	3 (8)
	Youth club	3 (4)	3 (8)
	Red Cross	3 (4)	
	Municipality	3 (4)	
	Community group		2 (9)

Source: Focus groups in the four study communities, Mombasa. *LICODEP* is a local CBO, the CDF stands for Constituency Development Fund (described below).

Results from institutional maps in both cities showed that institutions considered important by community members were not necessarily the same as those they perceived as assisting them in relation to severe weather.[30] In Mombasa, for instance, as shown in Table 16 above, local government representatives such as chiefs and elders were identified as important local institutions, yet did not take an active role in dealing with severe weather problems, except in Tudor. The following section provides further detail on the role played by these different institutions.

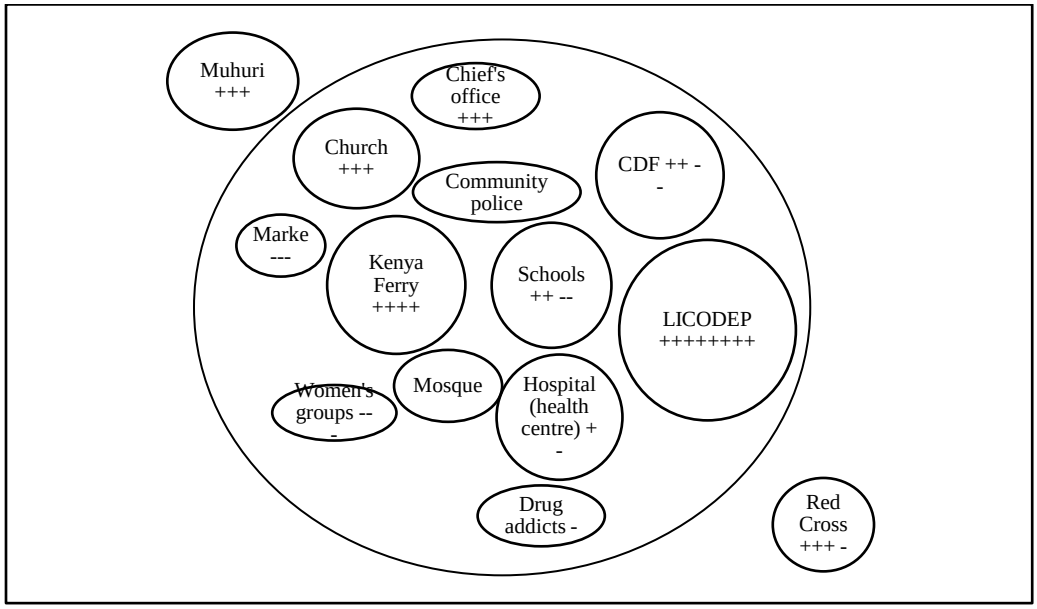
[29] Institutions important in the community were numerically quantified in terms of the number of times they appeared in the institutional maps. The first number in each column indicates the order of importance from first to third, with the numbers in brackets the absolute numbers. The data on institutions important in extreme weather was quantified in the same way.

[30] Focus groups in both cities first identified institutions that were perceived to be important generally in local communities, and identified whether they were inside or outside the community, and were perceived as positive or negative. Focus groups then identified those institutions that particularly assisted local communities in adapting or responding to extreme weather.

a. Government institutions

In Mombasa, external government institutions included the City of Mombasa, the Provincial Administration including the Elders, Chiefs, District Officers and District Commissioners, and the Constituency Development Fund (CDF). The police, government departments/ministries, and schools were also part of the government related institutions. Their main role in poor communities was the enforcement of law and order.[31]

Figure 7: Mapping of important institutions in Bofu, Mombasa



Source: 4 adult men aged 53–77 years in Bofu, Mombasa

As shown in Table 16, and illustrated by the institutional map from Bofu (figure 7), local government institutions within or outside communities, with the exception of schools and hospitals, were generally not perceived as important — as can be noted by the size of the chief and community police in Bofu. This indicated a lack of trust or confidence in government, as represented by Mombasa municipality. In addition, although chiefs and elders as local representatives perceived themselves as important, local community members did not necessarily concur with this and certainly local officials did little to build resilience in communities. While hospitals and health centers provided emergency treatment to community members who suffered from trauma, shock triggered by the floods, and water borne diseases such as cholera, dysentery and malaria, village elders, as part of the Provincial Administration infrastructure, mainly reported the incidences of problems to the chief and to District Officers.

One exception was the Constituency Development Fund allocated by the President to the four Members of Parliament representing Greater Mombasa (namely Changuani, Likoni, Highlands and Kisaumi, which includes Ziwa la Ngombe), and considered by some as the most effective mechanism by which to deliver resources for local community initiatives. Data from table 16 shows that in Bofu and Timbwani the CDF had a higher profile and was more positively viewed than in the other two communities where it was considered negatively, or non-participatory in its resource allocation.

[31] The Provincial Administration structure included government appointed elders, responsible for settlements or even households in the communities, sub-chiefs, chiefs, the District Officers, District Commissioners and the Provincial Commissioner. This network of institutions also had police units – with the Administration Police accountable to the Chief at the local level, and the Provincial Commissioner at the Provincial level. At ward level, as identified by a community leader in Tudor, were a range of local committees such as the Community Disaster Management Committee (set up to prepare communities as before El Nino), the Community Health Workers Committee and the Orphans and Vulnerable Children's Committee. However none of the focus groups mentioned such committees.

Local community leaders were quick to criticize local MPs and their use of funds. As Hilda one leader with over 30 years of experience commented:
'After 5 years in power he comes with another language, from his salary, from the CDF. The CDF is managed by the MP. If you did not campaign for him, he cannot give it to you. Who should manage it? It goes from the DC to the DO to the chief. The community can talk to the chief and he listens but the MP after 2-3 months when he comes it's just dust."

Commenting on the selection of Elders onto the CDF committee, a chief in one of the areas said:
'We don't make a mistake. It's very political; it will backfire"
Finally a young community leader attributed inequalities in the CDF to tribal loyalty
There are so many tribes here on the coast. The MPs here are from the coast — they do things for their own. The leaders divide us; If it is not time for politics we live like brothers and sisters.'

These findings contrast with focus group perceptions from Estelí. There the Town Council was considered a key institution for community development, especially for access to basic services and infrastructure. Focus groups commented that negotiations with other government institutions depended on being well connected at the local authority office. At the same time, the Town Council was not considered a key institution in supporting communities during severe weather. Three central government institutions (ministries of health and education; water and sanitation authority) were perceived to be the most responsive in emergency situations, even though these institutions did not have permanent presence in all four communities.

Photo 9 Local religious relief worker during floods in Mombasa

Most people agreed that the Ministry of Health had been effective in preventative health, in controlling malaria and dengue. Health centers were seen as providing satisfactory services before and during heavy rains. There were also some negative perceptions especially related to unresolved technical problems with the latrines installed by the Ministry. Strong linkages to schools were expressed, even though in two of the four neighborhoods, schools are located outside the neighborhoods. School buildings had been used as evacuation centers during heavy rains with many people having firsthand experience of taking refuge at schools either during Mitch, (Miguel Alonso) or during every rainy season (Lower 29 de Octubre, Lower Monte Sinai and Belen).

b. Religious organizations

In Mombasa, religious organizations included mosques, churches, and their associated organizations. In communities such as Timbwani and Bofu, there was a preponderance of mosques, while in Ziwa La Ngombe it was evangelical churches. Finally in Tudor there was a mix of both mosques and churches. As shown in Table 16, religious institutions were recognized as playing an important role when extreme weather occurred; they mobilized communities for evacuation, provided emergency relief assistance and mobilized support to affected communities particularly temporary rebuilding.

Similarly in Estelí, the Catholic and Evangelical Churches were valued for their welfare support to the most vulnerable families (see table 17). They were considered among the most responsive in cases of emergency, bringing resources from abroad especially for child development. Some women entrepreneurs said that the Church had helped them to restart businesses after flooding.
"*For me the congregation is a blessing from God because not only do they teach us the word of God, also they support women with some donations and small loans, for example in my case they gave me a loan to build a brick oven to make bread"* Small bakery owner, in 29 de Octubre.

c. Externally supported local NGOs and CBOs

In Mombasa an extensive range of NGOs and CBOs operated in all four communities. These can usefully be divided into two types: first the larger more prominent groups supported by external (usually international funding), and second, local self-help groups discussed below. As shown in Table 19, the most prominent were Action Aid, and, to a lesser extent KIKODEP, in Ziwa La Ngombe; LICODEP in both Bofu and Timbwani; as well as the Red Cross. Less important, but also present were Plan International, Compassion International, and Handicapped International. Such organizations were involved mainly in providing basic social services such as improving schools, installing safe water wells and in training and capacity building activities for improving communities and their organizations. Those located in the community, such as LICODEP and Action Aid were also identified as particularly important institutions dealing with severe weather even though in reality they played a minimal direct role in adaptation, mainly linking up affected members to potential institutions who could assist them.

In contrast, in Estelí the presence of international and/or national NGOs was rather limited. In Lower Sinai and Lower 29 de Octubre, NGO presence was virtually absent. Most people felt that this was closely linked to the illegality of the settlements. In communities where they existed concrete projects had been executed; in Upper 29th October, *United Families* constructed houses. In Monte Sinai, *Third World House* had purchased land and donated latrines. In Belen a food voucher program managed by INPRHU (*Instituto de Promoción Humana*) reached 500 children. A few women in Lower Sinai and Belen had obtained loans from microfinance institutions, although these had discontinued. Other women mentioned FUNORI, which had run a youth rehabilitation program. However, the presence of NGOs was generally short-lived, and one-off interventions had done little to positively impact the accumulation of community or household assets and even less to assist in coping with recurrent weather patterns. Focus groups in Belen identified the fragmented institutional coverage among the different sectors of the neighborhood, which, according to some residents, eroded community unity (see table 17).

Table 17: Listing of important institutions in adapting to weather in Belen, Estelí

Sector	Public Institutions	NGOs and External Donors	CBOs and Churches
North	• Ministry of Health • ENITEL * • ENACAL** • Union Fenosa*** • Fire Service	• INSFOP (*Instituto de Formación Permanente*) (child development) • INPRHU (welfare) • *Mejorando mi Familia* (family welfare) • Microfinance Institution	• CPC (*Comités de Poder Ciudadano*)
Central	• Health Centre • Fire Service • Red Cross • Police • Army • Town Council	• Cosude (Swiss Agency for Development and Cooperation) • INSFOP • INPRHU	• CPC • Churches
South	• Town Council • ENACAL • ENEL • Red Cross • Governmental microfinance project	• INPRHU • AMPYDE (*Asociación de Mujeres por la Paz y Desarrollo de Estelí*)	• Evangelical Church
South End	• Ministry of Health • Town Council • Fire Service	• INPRHU (welfare) • INSFOP (latrines) • CFCA (child sponsorship) • Canadian Agency • ACRA • FUNORI (rehabilitation) • Proniño (child development)	• Evangelic Church • CPC

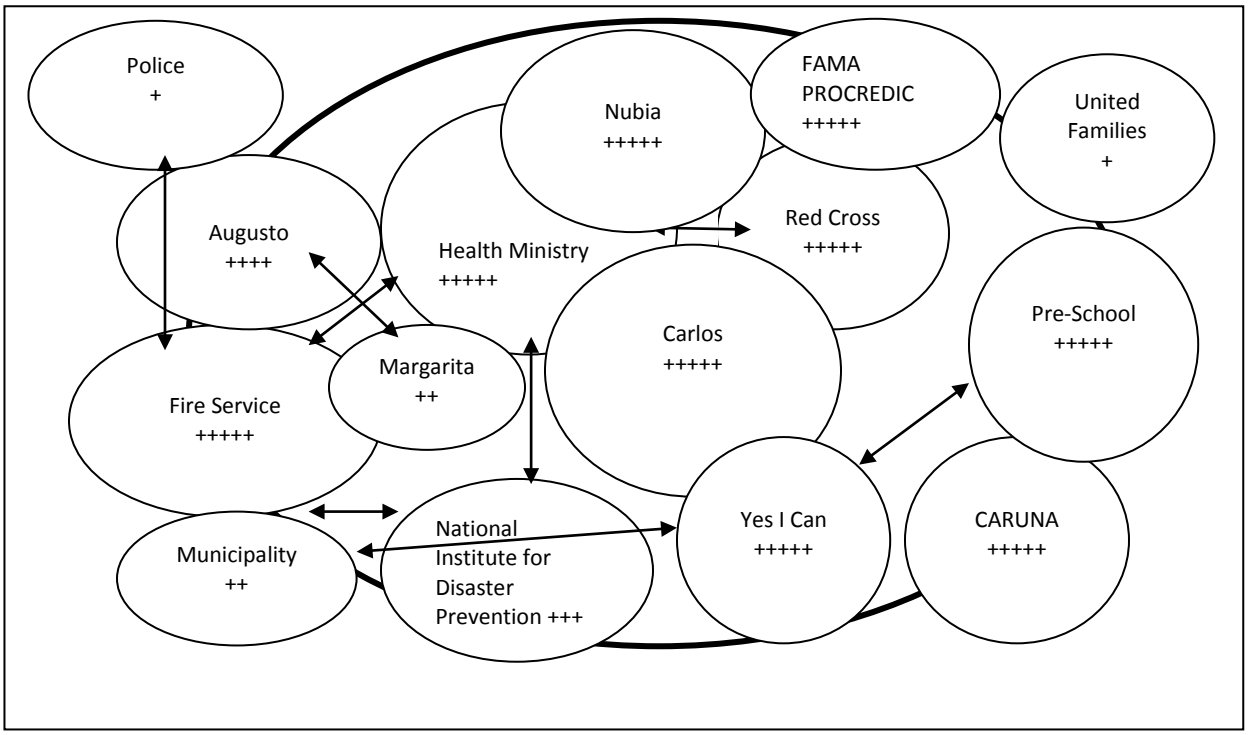
Source: Focus Groups, in Belen.
*phone company. ** Water company. *** Electricity company.

d. Internal community-based organizations and self-help groups

In Mombasa an extensive range of self-help groups, from youth and women's groups, to funeral organizations and family/clan organizations were identified at the community level. The plethora of local groups, many deriving from Kenya's historical welfarist traditions meant that their range and capacity varied; while women's business groups and microfinance organizations, such as *Sauti ya Akina Mama,* played important local roles in sustaining and nurturing small businesses across communities, others, such as vigilante groups, tended to be localized. Few of these institutions responded to severe weather problems, with a tendency to depend on formal institutions such as the mosques, churches and hospitals to actively respond.

Historically in Nicaragua community based organizations played an important role in negotiations with local authorities, for land and services, and in coping with natural disasters. For instance, most people made reference to the strength of collective community action of grassroots community organizations during Hurricane Mitch. However, recent government sponsored reorganization of CBOs had, according to the Estelí focus groups, eroded the natural leadership and cohesion of CBOs even in sectors of the communities where they enjoyed legitimacy. Since the new CPC, Citizen Power Councils were recently formed; their capacity to respond to severe weather events had not been tested. At the same time, in all four communities, key individuals, either within or outside the neighborhood, were perceived as important agents in community coping strategies. These were charitable persons, valued for their knowledge, contacts and capacity to solve problems especially in emergencies. In Lower Sinai, the coordinator of the neighboring community was recognized as an important actor. In 29 de Octubre, four individuals were amongst the most influential and ranked higher than some institutions (see figure 8).

Figure 8: Mapping of important institutions in adapting to weather in 29 de Octubre



Source: 6 adult females and 3 adult males aged 36-70 years in 29 de Octubre, Estelí

e. Inter-institutional collaboration

In Mombasa there were often strong linkages between institutions. Tudor presented the most insightful case of interconnected albeit limited responses by the state, community, civil society, and religious organizations. Table 18 shows how these institutions responded to rains and floods. As mentioned above, Muoroto and Mburukenge were the most vulnerable areas both in Tudor, and in the four communities in Mombasa. The proximity of these areas to the Council/City of Mombasa and other housing estates, its location at the Tudor creek sea front and in the drainage routes for Tudor's storm water and sewerage, further worsened the vulnerability of this area. It was therefore not surprising that the most visible of the limited institutional responses we found in Mombasa to the vulnerability of the poor to climate impacts was in the Tudor area.

Table 18: Institutional responses to problems caused by rains/floods in Tudor, Mombasa

Institution	Responses		
	Before	**During**	**After**
Chief	• report to the DO who reports to the DC • Hold Barazas (chiefs' forums) and raise awareness on dangers and risks	• report to Red cross, DO, DC, area councilor for support	• distribute food and clothing • provide security for the affected community
Village elders	• teach people on disaster management and preparedness	• inform various institutions on the disaster in their area • identify affected families for help	• offer counseling the affected families • advice on where is safe to live
Hospital		• provide health services	• provide awareness on health matters
Tudor joint committee	• create awareness • seek support from the Mombasa Municipal council	• Mobilize Youth to react to the incident	• plan to rebuild again
MUHURI	• create awareness • provide trainings/ workshops	• react to the incident in different ways	• follow up
Red cross	• provide trainings/ workshops • create awareness	• provide food, clothing, mosquito nets • provide medicine • providing temporary shelter (tents) to the affected people	• prayers • inform/ teach people on disaster management • provide humanitarian support
Religious institutions		• provide food and clothing to the families	• provide support e.g. shelter and food • provide counseling services
Community	• report to the village elder on early warnings of the disaster	• help in saving lives of the affected people	• help in implementation of mitigation measures to reduce the risks

Source: Compiled from focus groups discussions in Tudor, Mombasa

In Bofu, LICODEP and Action Aid were prominent in responding to problems caused by flooding and rain. Both institutions supported a community water project which has been useful in protecting and restoring disused and derelict water points/wells. Otherwise, the mosques and health centre played a significant role in addressing problems such as flooding in Dimbwini and Mwatsalafu. Again, as in Timbwani, Village elders and chief mainly

reported on how these floods affected their communities, while during very severe floods, the City of Mombasa provided emergency assistance such as pumping water out of flooded areas.

In Ziwa La Ngombe the government and its agencies responded most proactively to problems caused by flooding. Inter-agency collaboration was based on an ongoing slum upgrading program (KENSUP, Kenya Slum Upgrading Program), which included Provincial and Central government departments, the City of Mombasa and NGOs such as Shelter Forum. By building schools, clearing roads, and lighting up some areas of Ziwa La Ngombe, the government, through KENSUP, justifiably was seen to be responding to problems caused by rains and flooding.

Table 19: Inter-institutional responses to evacuation during flooding in 2007 and 2008 in 29 de Octubre, Estelí

Institution	Actions		
	Before	During	After
Municipality	• dredging of the river	• coordination with emergency services e.g. Civil Defense, Fire Service	
Community	• retention wall along the river • early warning system • coordination with Civil Defense, Police, Red Cross, Ministry of Health	• coordination of evacuation • protection of key household, and community assets	• cleaning up of mud • digging new dykes • reinforcement of the river wall
Households	• protection of houses	• protection of houses and possessions	• damage repair of houses and possessions
Civil Defense/ SINAPRED	• Risk Awareness and Vulnerability Map • general advice regarding disaster awareness	• evacuation logistics	
POLICE		• vigilance over properties and households assets	
Ministry of Health/ Ministry of Education	• space for evacuation center	• medicines, food • safe shelter	• health campaigns • fumigation
Red Cross	• management of disasters • emergency response e.g. transport to hospital	• transfer to safe places • medical support	
Individuals	• lobby for services	• provision of food, clothes, blankets, kitchen utensils	• lobby for services • acquisition of potable water

Source: Focus group with leaders held in 29 de Octubre, Estelí

In Estelí, inter-institutional coordination appeared to work best in Lower 29 de Octubre, both in terms of the role that each institution assumed over consecutive years during evacuations, as well as in terms of community preparedness before, during and after severe weather, and flooding. In Monte Sinai, and Belen, the responses were similar to those described by the focus groups in 29 de Octubre, although the Red Cross, Civil Defense, and the Police were not seen as institutions that had contributed to building up preparedness capacity, since their presence was focused on immediate actions during the recurrent rains; thereafter these institutions were absent.

f. Support within and between self-help groups

Ultimately support within and between self-help groups and the membership of multiple institutional sets may be an important indicator of individual and household level capacity to build resilience and cope with severe vulnerability in the face of negative impacts from climate change processes. These may include risk pooling institutions (e.g. rotating savings groups), labor market institutions (e.g. market traders associations), community institutions, and even in some cases rural communities where migrants often retain a stake. It is in the nature of the dynamics of vulnerability and resilience that multiple institutional memberships are likely to enhance an individual's position. Some of the key capabilities which may be enhanced are: the ability to re-locate quickly; the ability to source food in times of scarcity; the ability to raise finance in an emergency; the ability to make claims on services.

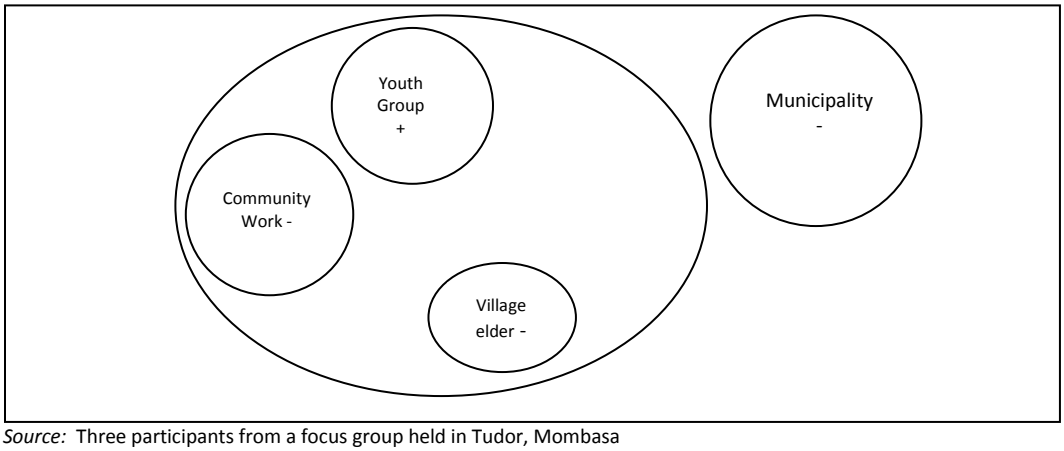
Box 6: Social networks of Mary, a community leader in Tudor

Mary came to Mombasa from upcountry in 1968 when her father, a Mau Mau leader was arrested. Her uncle already in Mombasa brought her and eight younger siblings to the city. The Social Service Department gave her a two-room rental accommodation on the Tudor Estate to house the family. She later swapped it with a retiring tenant of a bigger, three-bedroom, flat. She now lived with her son Patrick, his family, a daughter who had just had a baby, and a grandchild sent from the rural area. She had 14 grandchildren. She had originally worked in a Day Care Centre, and then became a Nursery school teacher. She was elected shop steward in 2004 for the Nursery School Teachers.

She was a member of five local network organizations. She was a founding member of the Ilishe Trust, a CBO working in the area. As a shop steward she was linked to a water project which fought for the rights of employees. She was a member of Mipendanan water point women's group in which the women own 12 taps and sell fresh water, paying bills to Coastal Water; '*We do not eat that money. It helps one in need with children's school fees*,' she says. As a well-known community leader she was asked to join the chief's committee. She was also in a women's merry – go –round savings group. This started with very small amounts of daily saving. She learnt the model when the Homeless Federation, through Ilishe, invited her to Zimbabwe. There the South African groups described how they had set up savings groups based on minimal daily savings. She saved a minimum of 5 shillings a day in the Tudor housing and savings group. As she commented, 'Here in Tudor we stay like brothers and sisters. I know your children. We create friendships and out of this we create credit groups'. She belonged to a Church Group, the Winner Chapel, and finally she was a member of a senior citizens group.

Focus groups from Mombasa showed that while some groups identified numerous linkages with institutional partners, others, generally poorer households or individuals identified far fewer institutional networks. This is illustrated by figure 9, which shows the very limited networks of a group of very poor households living right near the river on the extreme periphery of Tudor. In contrast, were the far denser networks of Mary, an older community leader — also resident in Tudor, but in the municipal provided housing (see Box 6).

Figure 9: Mapping of the most important institutions in adapting to weather in Tudor, Mombasa



Source: Three participants from a focus group held in Tudor, Mombasa

III. THE FRAMEWORK FOR RESPONSE: ADAPTATION POLICIES AND INSTITUTIONS IN MOMBASA AND ESTELI

This section presents the main findings on the institutional and policy frameworks for climate change adaptation in Mombasa and Estelí (based on the findings of the Rapid Risk and Institutional Appraisal). The first part explains how broad policies and national strategies in Kenya and Nicaragua address climate change adaptation in general, and more specifically in urban areas. Afterwards, it analyzes the legal, institutional, programmatic and fiscal frameworks linked to climate change policies in both countries. It points out the complexities that these frameworks have at the national, provincial and local levels, and why these arrangements are still ineffective in addressing the consequences that weather variability and severe weather events are having among the urban poor. Secondly, this section examines the policy challenges in the two cities relating to land tenure rights.

The review of legal, institutional, programmatic and fiscal domains in Kenya and Nicaragua showed the existence of a complex network of laws and institutions relevant to climate change, as well as to urban climate change more concretely. At the same time, there were still few functioning policies and programs with an effect on urban adaptation and a virtual lack of national and local policies with a direct effect on pro-poor urban adaptation. Fiscal resources to support pro-poor adaptation were also lacking, though some potential funding channels could be identified. The latter included both international and domestic mechanisms such as GEF, the Constituency Development Fund in Kenya, PRODEL or Social Investment Funds in Nicaragua.

3.1. Climate Change Policies and Strategies

a. Climate Change Policies at the Country Level

One significant, even if obvious finding from the RRIA is that national climate change adaptation frameworks tend to have a rural and environmental bias and to be prepared and led by ministries of the environment and natural resources. In Kenya, climate change activities at the government level have been limited mostly to the United Nations Framework Convention on Climate Change (UNFCCC) process. In the early 1990s, the Kenya Meteorological Department represented the country in the UNFCCC. Since the late 1990s the Ministry of Environment and Natural Resources has assumed leadership over Kenya's climate change policy and communication with the UNFCCC even though other ministries have also taken part in the dialogue on climate change policy. In the December 2008 UNFCCC Conference in Poznan, Poland, Kenya was represented by the Director of NEMA (National Environmental Management Agency). At the time of this study, there were few climate change initiatives beyond the Ministry of Environment, namely efforts by members the Office of the Prime Minister. Climate change was still broadly considered by politicians and government agencies as an environmental and rural issue. There was a general lack of understanding of climate change impacts on urban areas even though climate change was broadly perceived to affect multiple sectors.

The situation was similar in Nicaragua where, according to its legal framework, climate change activities were part of the mandate of the Ministry of Environment and Natural Resources (MARENA). The drafting of the Nicaraguan Adaptation Framework to Climate Change also followed the methodological guidelines of the UNFCCC process. This framework formed part of important national policies, listed in Table 25 below, such as: the General Environmental Law (1996); the National Environmental Plan (2001) which called for water resource management and forestry development; policies on environmental education and preservation of wetlands (2003); regulations on solid waste management and toxic materials; and policies on land use and cleaner production (2006). Existing legislation allows for incorporating a range of mitigation and adaptation instruments, yet mainly in rural areas.

According to Nicaragua's adaptation framework, its vulnerability to climate change derives from environmental imbalances generated by the country's development policies over a number of decades and resulting in water and soil contamination; soil erosion; an increased rate of deforestation; over-exploitation of fishing areas and mangroves; and poor waste management. The expected climate change impacts on Nicaragua would thus

primarily include water shortages, erratic rainfalls, increase of thermal pollution, and damage to the water infrastructure. The productivity of crops and livestock would be affected as well, leading to increased problems with food insecurity, more frequent fires and pests. The damage to coastal areas and lowlands and sea level rise would make the country more vulnerable to storms, tsunamis, and tidal waves.

b. Climate Change Adaptation in Urban Areas

Another important finding from the RRIA is the fact that policies and strategies relating to climate change adaptation in cities have a clear focus on disaster mitigation and prevention. This focus seems to be the consequence of the existing legal, programmatic and institutional frameworks, as well as of approaches resulting from the UNFCCC process.

In Kenya, the national strategy on climate change (NSCC) identified a series of natural disasters that might affect urban areas. However, within the disaster management and response sector in the country, there was no clear demarcation between general type of disasters and those induced by climate change. At the national level, extreme weather-related disasters were dealt by the Special Programs Ministry in the Office of the President. The National Disaster Management Policy, adopted in 2004, acknowledged that more than 70 percent of the natural disasters in Kenya were related to extreme climate variations. The law called for the establishment of the National Disaster Management Agency (NADIMA) whose mandate was to coordinate disaster risk reduction initiatives. At the Coast Province, the Provincial Commissioner's (PC) office was in charge of coordinating all disaster related issues across government's departments. The PC chaired the Provincial Disaster Management Committee where all heads of departments at the provincial level were represented. At the local level, the Mombasa Municipal Council dealt with impacts such as flooding and disaster response.

In 2000, Nicaragua established a national system for the prevention, mitigation and response to natural and man-made disasters (SINAPRED). Its main functions were to promote disaster prevention policies, mainstream risk management within regional and national plans, and build capacity for civilian protection response. Along with SINAPRED a number of committees were established at the national, departmental and municipal levels as well as sector-led commissions. The departmental and municipal committees in Estelí were coordinated by the Mayor. The major disaster risks that Nicaraguan cities are expected to face include hurricanes, intense rainfalls, flooding, landslides, as well as droughts and heat waves. Based on these expectations, identified by the national climate change framework, local strategies on climate change in urban areas were developed with a focus on preventing and mitigating natural disasters. Thus the analysis of more gradual weather changes has largely been left out of city-level policies.

There are a number of similarities between climate change strategies in Kenya and Nicaragua which reflects the approach followed in each country for the elaboration of national strategy — a process supported by international donor agencies and by the United Nations system in particular (see Table 20).

Table 20: Basic characteristics of national strategies on climate change in Kenya and Nicaragua

Basic characteristics	Kenya	Nicaragua
UNFCCC process	• Yes	• Yes
Agency responsible for national climate change strategy	• Ministry of Environment and Natural Resources • National Environment Management Authority (NEMA) coordinates environmental issues	• Ministry of Environment and Natural Resources (MARENA)
Main focus of strategy	• Rural	• Rural
Strategy's approach in urban areas	• Prevention and mitigation of natural disasters caused by extreme weather events	• Prevention and mitigation of natural disasters caused by extreme weather events
Policy and main agency responsible for extreme weather related disasters (year of establishment)	• National Disaster Management Policy (2004); • Special Programmes Ministry in the Office of the Presidency	• Law for the creation of the National System for the Prevention, Mitigation and Attention to Disasters (SINAPRED) (2000)
Key provincial/department and local level agencies dealing with climate change related disasters	• Provincial Commissioner's (PC) office coordinates Provincial Disaster Management Committee	• Departmental Committee for the prevention, mitigation and attention to disasters (CODEPRED) • Municipal Committee for the Prevention, Mitigation and Attention to Disasters (COMUPRED)

Source: Own elaboration based on the Kenyan and Nicaraguan reports, and UNDP (2006)

c. Legal, Institutional, Programmatic and Fiscal Domains of Climate Change Policy

The division of policy response and implementation capabilities into four key domains (legal/regulatory, institutional, programmatic and fiscal) is a useful tool for looking into the comparative strengths and weaknesses of policy delivery systems (Norton, Gacitua-Mario and Georgieva 2009).

The overlap of legal instruments, the lack of clear mandates and effective coordination of programs within and between sector ministries as well as among the various levels of government (national, provincial, and local) affects the implementation of climate change adaptation strategies. The absence of concrete fiscal support is yet another serious limitation to adaptation policies. Clear legal and institutional coordination and funding channels, relevant to urban areas, would make national adaptation strategies more meaningful in terms of supporting the efforts of the urban poor to protect their assets.

At the time of the study, there were no Acts of parliament or specific bylaws in Kenya to promote pro urban poor climate change adaption. Funds managed by the Global Environmental Facility (GEF) under the UNFCCC agreements for this purpose were still unavailable. However, there were a number of policy and legal instruments with an indirect impact on the adaptation strategies of the urban poor (see Table 21). A National Climate Change Bill was in an early discussion phase and may take years to be enacted in law. Land and physical planning regulations were significant in enhancing resilience of the poor to climate change since insecurity of tenure was a key factor in their vulnerability. Yet, the long drawn National Land Policy was still in a draft form, and not all cities, including Mombasa, had a physical and development master plan as required by the Physical Planning Act, Chapter 268. This act did not provide for the participation of the poor in decision making and it focused entirely on service delivery. The most elaborate legal instruments were those regulating the National Environment Management

Agency (NEMA) which originated from the Environmental Management and Coordination Act 1999 (EMCA) and included 77 different environmental statutes.

The institutional framework required to implement these policies at the national, provincial and local level was an additional obstacle for climate change adaptation. The National Climate Change Activities Coordinating Committee, located at the Ministry of Environment, had the mandate to advise the Ministry on broader climate policy issues. The Committee worked under NEMA whose legal mandate involved coordinating and supervising all environmental activities, including climate change. At the national level, the Ministry of Planning and National Development was responsible for all government plans, and NEMA was to feed environmental planning, into this national planning level, something that did not always happen.

The Provincial Commissioner's (PC) office was responsible for coordinating the government departments at the provincial level, yet as shown, its main focus was on disaster risk management. The PC chaired the Provincial Disaster Management Committee, where all heads of departments at provincial level were represented. Climate information was provided to this committee by the Provincial Director of Meteorology (the Kenya Meteorological Department was the custodian of weather and climate data in all regions of the country). Other institutions in the Committee included the Kenya Maritime Authority, who measured water and tidal levels, Kenya Wildlife Services and the Fisheries Department. Together with the Kenya Agricultural Research Institute (KARI), the Meteorological Department was meant to provide agro-met data to local farmers although this was not effective. The Provincial Director of Meteorology was to give regular briefs to the local authority in Mombasa, yet this was not done in a structured way, which precluded effective planning for extreme weather events.

In addition, a number of policies and plans targeted specifically at the Coastal Zone had not yet been implemented. These included the Integrated Coastal Zone Management Policy and the Integrated National Coastal Zone Management Plan, probably one of the most elaborated programs that included climate change adaptation issues. Para-state agencies were involved peripherally on climate change issues, but not directly on adaptation.

In Mombasa itself, relevant agencies included the Kenya Forestry Services, Integrated Coastal Development Authority (for shore line management), Maritime Authority (deep sea), National Highways Authority, National Rural Roads Authority and National Urban Roads Authority (see Table 21). These agencies did not work directly in poor locations, except for very specific infrastructure projects. In terms of housing there were some efforts by the Ministry of Housing, who together with UN-Habitat was implementing the Kenya Slum Upgrading Programme (KENSUP). Although there was some planning of settlements, e.g. in Ziwa la Ngombe, no housing and infrastructure had been built yet due to lack of funds.

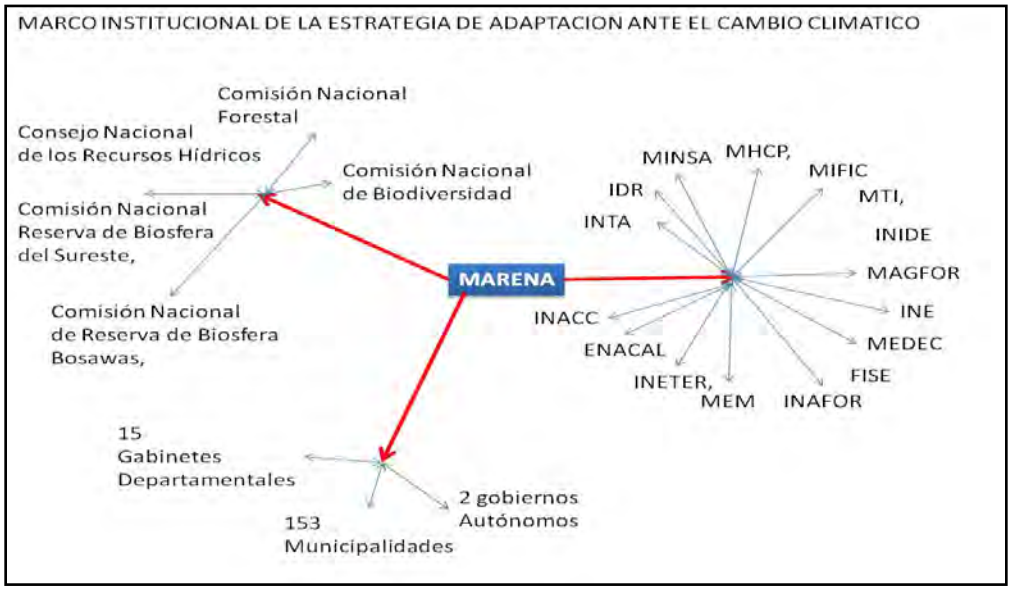
In Nicaragua, environmental legislation over the past decade and especially in the aftermath of hurricane Mitch incorporated various climate change adaptation and mitigation instruments into national policies (see Table 21). However, as these policies were considered sectoral, and, in some cases, even sub-sectoral, their priority within the decision making process of the entire set of State policies has been very low. The national strategy on climate change adaptation called for activities at three levels: first, at the level of National Congress to generate the adequate legislation, and at the Regional and Municipal Councils, who have the power to set environmental norms and rules at the local level; second, at the level of Ministries and their territorial delegations as they are the ones to implement part of the strategy; and lastly, at the level of MARENA as the main rector and coordinator of this strategy. This in itself shows that complicated levels of decision making were required to make the strategy operational.

Table 21: Climate Change Adaptation Policy Analysis: Kenya and Nicaragua

Policy Domain	Kenya	Nicaragua
Legal: Framework of bylaws, policies and decrees related to climate change adaptation	• National Climate Change Bill (in discussions) • Environmental Management and Coordination Act (EMCA) • NEMA regulations: EIA; waste management; water quality; bio-diversity; ozone depletion; noise; air quality; chemical substances • Draft National Land Policy • Physical Planning Act, Chapter 268 • National Development Plan 2002-2008 • Integrated Coastal Zone Management Policy (ICZM) • National Disaster Management Policy, 2004 • Proposed National Climate Change Policy • Constituency Development Plans; • Forests Act; Fisheries Act; Water Act; Agriculture Act; • Local Government Act	• Nicaraguan Adaptation Framework to Climate Change (MPA) • Environmental & natural resources Law • Nicaragua's Environmental Policy, 2001 • Nicaragua's environmental plan, 2001 • Integral management of water resources policy, 2001. • Forestry Development Policy, 2001. • National policy & strategy for Environmental Education, 2003 • Wetlands National Policy, 2003. • Law for conservation, promotion & sustainable development of forestry sector, 2003 • Law for the promotion of electricity generation from renewable sources, 2003 • National Policy on Integrated Management of Solid Waste, 2005. • National Policy for Waste & Hazardous Substances Management, 2005. • National Policy on Cleaner Production, 2006. • Land Policy Framework, 2006. • National Human Development Plan, 2008 • Municipal Law
***Institutional*:** main public institutions and organizations involved in climate change adaptation at national and provincial/departmental levels	• *Government Institutions* - Office of the President: Provincial Administration (deals with disaster response coordination - Ministry of Environment (climate change & national climate change response strategy) - NEMA - Mombasa Municipal Council - Integrated Coastal Development Authority - Maritime Authority	• *Government Institutions* - Ministry of Environment and Natural Resources (MARENA) but incapable of ensuring its role given the complexity of commissions and actors it deals with - SINAPRED national, departmental and municipal level but mainly to natural disasters - Departmental Commission (both SINAPRED and Environment), sometimes overlaps, and difficult to convey all actors
Programmatic: assessment of relevant programs for climate change adaptation and an assessment of their status	• Kenya Coast Development Program • Mombasa Mainland and Kwale Regional Physical Development plan (not been implemented).	• Environmental plans promoted at the municipal level • FHIS infrastructure projects • PRODEL infrastructure and basic services component
***Fiscal resources*:** resources available for climate change adaptation	• None although possible GEF • Insights from Constituency Development Fund (CDF) model	• Global Environmental Facility (GEF), • Municipal resources, • PRODEL • Social Investment Funds like FISE

The existing laws and decrees in Nicaragua established at least five inter-institutional national commissions which MARENA coordinated: the National Council on Water resources; the National Commission on the Bosawas Biosphere Reserve; the National Commission on the Southeast Biosphere Reserve; and the National Commission on Biodiversity and Forestry (see Figure 10). In addition, the national strategy on climate change called on MARENA to coordinate with 16 other ministries and semi-autonomous governmental institutes including the Nicaraguan Institute of Territorial Studies INETER; the Ministry of Agriculture and Forestry MAGFOR, the Ministry of Energy and Mining MEM, the Ministry of Development, Industry and Trade MIFIC, and the Ministry of Transport and Infrastructure MTI); the two regional autonomous governments of the Atlantic Coast; 153 municipal authorities; and 15 departmental councils (see Figure 10). The efforts that this level of coordination required, without having the necessary staff, political leverage instruments to enforce the strategy, as well as the fiscal resources to generate incentives diminished the effectiveness of MARENA's work on climate change in general. The attention on urban adaptation strategies in collaboration with local authorities, and specifically on pro-poor urban adaptation, was thus in effect missing.

Figure 10: Institutional Framework of the Climate Change National Strategy in Nicaragua



Source: MARENA (2009).

In Estelí, it was the office of the vice-mayor and the environmental management unit that had the lead on climate change adaptation. According to the Estelí Municipal Government program for the period 2009-2012, the main activities related to climate change were geared towards the protection, conservation and good use of water sources in the municipality, a reforestation program in urban and rural communities, strengthening of the municipal environment commission, mapping of the environmental situation, and strengthening the community bridges against fires. Other civil society and international donors also contributed to climate change program design (see Table 22).

Table 22: Institutional and policy issues relevant to climate change adaptation in Mombasa and Estelí

Characteristics	Mombasa	Estelí
Main climate change impacts on the city according to national and local authorities	• Winds, storms & cyclones • Coral reef destruction and salination of ground water • Severe weather events' impact on health (cholera, vector borne malaria and typhus)	• River flooding • Soil instability • Droughts (water scarcity) • Contamination of superficial waters and water sources
Main municipal departments/units dealing with climate change issues	• Housing • Environment • Fire Department	• Vice-Mayor • Environmental Management Unit (UGA); • Territorial Planning Unit
NGOs and church based organizations working in CC	• Action Aid; Oxfam GB; World Vision, and Practical Action; • Christian and Muslim charities (e.g., Bilaal Muslim Mission of Kenya) • Red Cross & Red Crescent • Kinship and clan based organizations, • Small savings groups of women	• Agro-Acción Alemana • ASODEA • PRODEL • Centro Alejandro Humboldt • Red Cross • Consejos de Poder Ciudadano (Citizen Power Councils) •
International development cooperation agencies	The World Bank, UNEP, UN-Habitat; Sida; DANIDA	• DANIDA

3.2 Land and Tenure Right Issues

The existence of complex and incompatible land policies, as well as inefficient land management and administration systems affect the possibilities of the urban poor of accessing affordable and adequate land, and therefore, they usually end up squatting in high risk areas prone to natural disasters caused by severe weather events.

During the last decade, land issues resulted in acute environmental, social, economic and political problems in Kenya, partly due to the lack of coherent and defined policy and legal frameworks. A complex set of land laws, policies and practices evolved since independence, some of which were incompatible resulting in an overly complex and inefficient land management and administration system. The system was also hugely prone to patronage — with the Presidency having great latitude to reallocate land with little scrutiny or control. From this ensued deterioration in land quality, squatting, landlessness, tenure insecurity, disinheritance of some groups and individuals, and more recently, conflict following the general elections in December 2007. An important first step to improving the situation on land tenure, including in the urban sector, was the Draft National Land Policy recently approved by Cabinet. This policy envisages democratic and decentralized land governance and management systems. Substantial part of the Ministry of Lands' current functions was transferred to a reformed National Land Commission and to a set of decentralized District Land Boards and Community Land Boards. To ensure transparency and reduced interference by politicians, these Boards would be empowered to perform key administrative functions. The draft policy also sought to address contentious issues, such as compulsory acquisition and development control as well as tenure. It recognized the need for tenure security for all Kenyans — all socio-economic groups, women, pastoral communities, informal settlement residents and other marginalized groups. Finally, the draft policy recognized communal ownership of land and re-established the standing of customary land rights. However, there were still serious challenges before this legal framework and new policies could be realized. An immediate challenge was securing approval of the National Assembly for the draft land

policy.[32] Other challenges included affordability and a sustainable funding model for implementation, rampant corruption, and capacity for decentralized implementation among others.

The situation in Nicaragua was relatively more stable. Although land issues were contentious during the 1990s, they diminished during the last decade. The conflict over land in Nicaragua was linked to the lack of clarity in land titling generated by the urban and rural land reforms of the Sandinista Regime in the 1980s, and the successive measures by the anti-Sandinista governments since 1990 to reverse these reforms. This led to serious legal disputes over land, many of which are still unresolved today. Nevertheless, evictions hardly took place and informal settlements have felt relatively secure. The Nicaraguan government created the Office for Territorial Ordering in 1991 with the mandate to review the juridical status of all informal and spontaneous settlements. Thus despite the persisting lack of clarity in land ownership, informal settlements had a relatively secure recognition of occupation rights. The Municipal Law of Nicaragua provided municipalities with the responsibility to plan, set standards and control land use in urban, semi-urban and rural areas, as well as control construction norms and standards. Municipalities were also responsible for providing basic services such as solid waste management, water sewage and pluvial drainage.

[32] The Kenyan National Land Policy was due to be passed by the National Assembly in 2010

IV. CONSULTATION AND VALIDATION OF RESULTS

Complementing the PCCAA and RRIA, the final stage in the urban climate change adaptation appraisal process piloted in these case studies was the validation, or confirmation, of results. The purpose is not only to share results but also to identify gaps in perception between the urban poor, and policy makers, politicians and practitioners in terms of asset-based adaptation to climate change, and to identify ways in which the latter can strengthen the capacity of the urban poor to build long term resilience to climate change.

The consultation process depends on the level of commitment of the different social actors involved. While in Mombasa this was limited to a stakeholder meeting; in Estelí it comprised an institutional workshop as well as an action planning training seminar. Table 23 summarizes the logic, objectives, main participants, and results from the three meetings.

Table 23: Characteristics and results from the consultation and validation processes in Mombasa and Estelí

Characteristics	Mombasa	Estelí	
Nature of the event	• *Stakeholders consultation meeting*	• *Local institutional workshop*	• *Action planning training seminar*
Participants	• National, provincial and municipal authorities; NGOs, CBOs, international development agencies, research institutions, press	• National and municipal authorities, and technical staff; NGOs; CBOs; international donors, universities.	• Municipal staff, FAREM and PRODEL.
Objective of the meeting	• Share methods and findings from PCCAA and RRIA exercises • Discuss opportunities that Copenhagen Conference presents for community adaptation to climate change	• Identify vulnerability of Estelí to climate change and risk factors • Analyze institutional and programmatic frameworks related to climate change adaptation	• Train local government staff on how to incorporate into action planning approach and methods, climate change asset-based adaptation strategies by the urban poor.
Main results	• Information sharing on PCCAA and RRIA • Capacity building on climate change adaptation strategies • Identification of gaps between stakeholders and community perceptions of climate change	• Mapping of city's vulnerable areas to climate change and main risk factors • Mapping roles of key policies, institutions and programs linked to climate change risk reduction	• Identification of gaps between climate change adaptation strategies of urban poor communities, and municipal development plans and norms • Identifying negotiating spaces

The consultation process revealed that to generate pro-poor urban climate change asset adaptation strategies requires adequate, feasible space that allows not only for information sharing, and knowledge transfer, but more importantly, for negotiations between representatives of government, NGOs and CBOs.

In Mombasa, the stakeholder meeting, attended by representatives of provincial and local governments, as well as NGOs, CBOs, private sector, international donor community and the press, generated initial awareness, knowledge sharing and capacity building on climate change adaptation. Since, for the majority of participants, especially for those from government, this was a new planning concern, the meeting was important in opening a dialogue

between different stakeholders, especially Mombasa's municipal council members and CBOs' representatives from the communities where the PCCAA took place. It allowed participants to focus on how the lack of land tenure rights, infrastructure and basic services affected the urban poor's capacity to adapt to severe weather events during often imperceptible changes in weather conditions.

In Estelí, participants in the institutional workshop, from central government, the Municipality of Estelí, NGOs, international donors, and FAREM, were asked to map collectively the city's most vulnerable areas to possible disasters, including those barrios (neighborhoods) most affected by severe weather events. Some of the areas identified in the workshop coincided with the barrios where the PCCAA took place (see Table 24). Participants listed on-going programmatic interventions that were addressing these vulnerabilities (see Table 25). This exercise allowed sharing information as to what each organization was doing in terms of climate change related issues, and to locate areas and barrios that although vulnerable, were not properly served by their programs.

Table 24: Identified vulnerable areas to climate change risks in the city of Estelí

Major risks	Contributing factors	Barrios (neighborhoods) more at risk
Flooding	Located on the margins of the Zanjón (trench)	A. C. Sandino, Los Ángeles, Boris Vega, 14 de Abril, Igor Úbeda, El Calvario
	Located on the riverbank of Rio Estelí	Los Ángeles, A. C. Sandino, La Comuna, José Benito Escobar, Panamá Soberana, Virginia Quintero
	Riverbanks of Rio Estelí and El Zapote ravine	29 de Octubre, Boris Vega, Filemón Rivera, La Comuna, 14 de Abril, Arlen Siu, Panamá Soberana, A. C. Sandino, Los Ángeles
	Poverty	29 de Octubre, Filemón Rivera, Oscar Turcios, Boris Vega, Sinaí, Belén
	Lack of latrines	Omar Torrijos, 29 de Octubre, Filemón Rivera, Estelí Heroico
	Distance and streets in bad conditions	Oscar Gámez, Noel Gámez, Monte Sinaí, Estelí Heroico, La Thompson
Contamination	Solid waste and garbage accumulated in the Zanjón (trench)	A.C. Sandino, 29 de Octubre, Los Ángeles, Ronaldo Arauz, Oscar Turcios, Estelí Heroico. La Comuna, José Benito Escobar, Filemón Rivera

Source: Institutional Workshop in Estelí Barrios marked in bold where study undertaken

In the subsequent training seminar in Estelí, attended by members of the political and technical staff of the Municipality of Estelí, PRODEL and FAREM, participants analyzed the ways by which action planning could be used by the municipality to identify, prioritize and negotiate climate change adaptation strategies with urban poor communities taking into account the political and social context prevailing in the city in general, and in the barrios in particular, as well as Estelí's long term municipal development plans and building norms.

Action planning processes are driven by problems which local government and community based organizations jointly identify, prioritize and negotiate, followed by the most feasible solutions according to available resources. Climate change-related action planning poses particular challenge; it is often difficult for external actors to recognize social, economic and physical vulnerability being generated by changes in weather; equally they fail to see the urban poor's ongoing adaptation strategies to protect their assets; finally it is difficult to identify the different mechanisms and instruments available to local authorities for strengthening the long term resilience of poor communities.

Following the action planning methodology that PRODEL, together with the municipality, had already used in Estelí, participants in the training seminar identified how to introduce climate change issue with the communities during the problem identification phase. The PCCAA showed the importance of identifying problems associated with small and imperceptible weather variations, rather than those associated with dramatic climate change. Participants discussed whether a barrio's vulnerability to climate change constituted a criterion for preselecting it for municipal investments, just as poverty and the levels of basic services and infrastructure were already pre-selection indicators used by PRODEL and the municipality. Consensus was reached that if two barrios had the

same level of poverty and of services and infrastructure, its vulnerability to climate change, could influence the decision.

Table 25: Actions of local institutions to reduce vulnerabilities generated by climate change associated risks, Estelí

Risk	Risk Factor	Strategy	Main actors
Flooding	Barrios located near the Zanjón, the riverbanks of River Estelí, and the El Zapote ravine	Emergency responses	Municipality, Humboldt Centre
		Mobilization	Army, Red Cross, Fire Department
		Organization to face emergencies	Agro-Acción Alemana, ASODEA, MIFAMILIA, Municipality
		Communication equipment	Agro-Acción Alemana
		Environmental education in the barrios	Municipality Centro Humboldt, Agro-Acción alemana, FAREM, ASODEA, MINED
Contamination	Accumulation of garbage in the Zanjón (trench)	Waste management prevention through action plans with communities	Municipality
		Municipality fines households throwing garbage into the trenches	Municipality
		Environmental education to protect water sources	Municipality, Centro Humboldt, Agro-Acción alemana, FAREM, ASODEA, MINED
	Deforestation	Forestry campaigns	Municipality
	Grey and waste waters	Interaction with ENACAL (Water and sanitation company)	Municipality
		Identify areas were grey and served waters are thrown	Municipality
Forest fires	Drought	Environmental education in the barrios	MARENA
		Community Organization to face emergencies	MARENA

Source: Institutional workshop in Estelí

The seminar in Estelí also highlighted the threefold gap in perception that existed between:

- The long-term solutions the Municipality wanted to implement in the PCCAA-located barrios (mainly the lower parts of Monte Sinai and 29th October),
- The expressed needs of community organizations and households,
- The ongoing asset adaptation strategies to weather events.

Most technical specialists in the municipality were unaware of, or had difficulty in recognizing, the investments households were already making to protect and adapt their assets to severe weather variations. They also were reluctant to recognize tenure rights of residents living in the lower parts of 29 de Octubre (near the riverbank) and Monte Sinai (near the ravine) even though the municipal authorities had not offered either short or medium-term alternative relocation sites.

When shown photos of the barrios, technicians commented 'they put some stones and they make contention walls'. However, they insisted that these were flood prone areas, and that any public investment would be wiped out in the next flooding, and therefore were not worthwhile. Settlers in these areas were considered as speculating with land, and should not be granted tenure in the 'green areas' they had invaded. Despite support from the vice-mayor of Estelí, it was difficult for the municipality's technical and social units to find possible common grounds in the action planning exercise concerning the location of households living on the Río Estelí riverbanks, as well as in the lower part of Monte Sinai neighborhood.

Finally the seminar highlighted subtle differences between political leaders and technical staff in determining the scope of a participatory action planning exercise. While Estelí's Mayor and Vice-mayor were willing to be more inclusive in terms of representation from communities, the technical and social units prioritized working directly with the leaders of the *Consejos del Poder Ciudadano* or citizen power councils (CPC). These were established by the current Sandinista government and in the majority of cases comprised Sandinista Party members their sympathizers.[33] Although this appeared to be a bottom-up process, NGO members criticized these consultations processes, as sometimes, CPC leaders lacked legitimacy within their barrios, and do not represent the interests of different sectors. This could have important implications for future climate change asset adaptation strategies supported by local government, if it took into consideration only the opinions of the 'community leaders' following partisan guidelines, and not the diversity of positions that might exist within a neighborhood, which included the need to strengthen existing efforts to build resilience.

[33] the opposition, as well as by academic circles, and civil society organizations considered the CPC to be a top-down community based movement, controlled and led by central government to advance its political agenda at the municipal and barrio levels.

V. CONCLUSIONS AND RECOMMENDATIONS

Climate change provides a unique opportunity for thinking and planning for the future on the premise that everyone will be affected, although some will suffer more than others. This relates to their level of vulnerability and the assets they currently possess to face severe weather and weather variability. Strengthening the urban poor's long-term resilience to climate change will require rethinking how power relations affect the efforts of the poor at the national and local level. It will also require sustained political support; suitable social and technical approaches; adequate urban planning methods, as well as a substantial commitment of financial and human resources.

On the basis of the case studies conducted we can draw the following concluding messages:

On understanding urban vulnerability:

Climate science is limited at the city level but this should not be a constraint on thinking how to build resilience. By drawing on the lived experience of urban communities much can be learned about both the impacts of a changing climate — and the ways in which spontaneous adaptation occurs and can be supported. People in local communities — despite their urban location — know about weather, perceive variations in weather patterns and have reasonable knowledge as to how it is affects assets and well being (at the household, community and business levels).

The case studies for this paper are not dramatic 'shock' disaster stories of climate change. Rather poor people living in slums and peripheral settlements experience the very slow incremental impacts of long-term trends in increasing severity of weather. This is very probably a widespread situation in many of the urban centers of many developing countries. Because these changes are invidious and sometimes imperceptible, they tend to be ignored. There is therefore a mismatch between the perceptions of local authorities and those of communities regarding locations and sources of vulnerability and potential solutions. Institutional responses focus mainly on top-down disaster relief during or after severe weather events, rather than on building resilience and supporting the adaptation capacity of local institutions.

People living in slums and peripheral settlements, already experience physical, social and legal vulnerabilities related to their poverty, physical location and exclusion from most basic services. This on-going vulnerability is exacerbated by severe weather and increased variability of climate.

The lack of formal land tenure rights makes the poor particularly vulnerable to severe weather: they squat on the most vulnerable land; without tenure rights, municipal authorities are less likely to provide municipal services; because they lack tenure households are reluctant to invest resources in adaptation measures to build resilience in their plots; the lack of formal tenure impairs their capacity to make claims for services and exercise voice as citizens.

Important public institutions (both state and non-state) identified in local communities did not necessarily assist households, small businesses and local community groups to adapt either to severe weather or to invidious changes. Indeed, most adaptation measures were local bottom-up initiatives.

The majority of households, small businesses and community groups were resourceful in developing a range of asset-related strategies including: a) asset adaption to build long term resilience; b) asset damage limitation and protection during severe weather events; c) rebuilding asset portfolios after severe weather. The incremental, invidious nature of weather changes meant that such responses were not always identified as three specific stages but rather as a continuum. Within communities, differentiation among institutions depended on social capital. Household responses were greater than those of small business which in turn were greater than community group-level initiatives.

On the institutional and policy framework for response:

In the two case study countries, climate change adaptation policy has been mandated to ministries of environment and natural resources. This is a widespread pattern in many developed and developing countries. At the same time, countries have numerous legal instruments relevant to climate change adaptation that are not under the ministry of environment and are spread across a number of ministries. This has a series of implications in terms of the following: *The lack of effective coordinating mechanisms within and between these sector ministries results in overlapping programmatic initiatives, and institutional confusion*; *The ministry of the environment, that is meant to coordinate the web of cross cutting initiatives, lacks political power, budget and institutional capacity; Climate change adaptation policies managed by the ministry of the environment and natural resources tend to have more of a rural and less of an urban focus; Even when the ministry of the environment develops urban policies it focuses primarily on the prevention and mitigation of natural disasters provoked by extreme weather events.*

From a policy perspective clarifying tenure rights and developing coherent urban land policy frameworks is of the utmost importance for building resilience of the urban poor to negative climate change impacts. The lack of comprehensive land policies for the poor, as well as inefficient land management and administration systems, limits the poor's capability to access affordable land or upgrade from squatter status. Strengthening tenure rights and clarifying land policies should also help to establish a better framework for citizen voice — enabling poor people to make claims on urban services which matter a great deal in building resilience, such as garbage collection/disposal and sanitation.

National governments, local governments, NGOs, donors, and private sector, and even academics very rarely are aware nor see the asset-based adaptation strategies that community groups, households and small business are already implementing. Until these range of institutions recognize the initiatives and enterprises of local communities they will fail to provide support for the urgent long-term resilience to cope with climate change.

Recommendations for action

To understand both the impacts of climate change in urban areas, and the most effective balance of actions to address it, it is essential to take account of the realities of the urban poor — particularly those living in informal settlements with weak tenure rights, low visibility to formal institutions, little access to urban services, and weak voice accompanied by unrecognized citizenship (see as membership of the urban community with accompanying rights and responsibilities). Participatory assessment and urban planning methods of the kind piloted here have huge potential to bridge the gap between institutional stakeholders and the urban poor. Urban vulnerability assessment methods which do not involve talking to poor people (particularly those in informal urban settlements) run a significant risk of promoting policies which make their situation worse. Approaches to understanding the impacts of climate change on the urban poor (through their experience of existing extreme and severe weather phenomena which are likely to get worse) should therefore be routinely incorporated into urban climate change vulnerability and adaptation planning processes. Such work can have the added benefit of highlighting in national level policy debates the significance of climate change impacts for poor people in urban areas, and thereby countering a common impression that such impacts are only of relevance for rural populations.

Given the wide range of localized adaptation action already taking place in poor urban communities a high priority should be channeling resources to local community level institutions to develop resilience. Elements of this can support the strategies poor people are already employing at the household level to strengthen the robustness of key assets (e.g. housing) in the face of worsening patterns of severe weather. As described above similar actions can be identified for small businesses and at the community level — to protect communal assets, such as drainage systems, schools or sanitation facilities. In both of the study sites the potential exists to use a rich network of local institutions as intermediaries or facilitators to broaden and strengthen these adaptive responses.

A key dimension of the work to strengthen local institutional frameworks for dealing with climate change adaptation will involve building community organizational structures which can enhance the voice that poor people have in planning and implementation processes. For example, the capacity to make claims on urban services and infrastructure investment could be strengthened through building organizational capabilities at the local level. Processes of participatory planning and deliberation addressing climate change trends and impacts can help to strengthen and focus collective action to ensure that resilience is built through better local level land use and such infrastructural and service support as can be managed or co-produced locally (e.g. clearing out drainage ditches). Trusted local institutions, whether community based organizations and NGOs (as in Mombasa) or local government (as in Estelí) can provide critically important institutional structures for the delivery of community-based climate change adaptation funds (CCAF). To ensure that such funds, designed to build resilience against future severe weather patterns, reach the intended local poor populations, will require assessments of the appropriateness of existing models for community-based development and the field-testing of context specific climate change adaptation funding mechanisms. The Mombasa and Estelí field sites used for this study could provide useful testing grounds for the development of new models of support for building local level resilience in the face of climate change impacts.

Box 7: The critical role of local government in climate change adaptation

The RRIA in Estelí and Mombasa shows the complexities of promoting and coordinating effective climate change adaptation strategies at national and sub-national levels. Yet, it is at the local level that these strategies are most required; since backlogs in the provision of basic infrastructure and services will only be exacerbated by the effects of extreme weather, severe weather and climate variability.

Local governments, therefore, inevitably will play a key role in facing these problems. Thus, international aid agencies as well as national governments should aim to strengthen the capacities of local governments so that, together with the inhabitants, they can transform the challenges generated by climate change into opportunities to radically address severe infrastructure deficiencies identified in this report.

ANNEX I

Methodological Guidelines for Implementing Urban Participatory Climate Change Adaptation Appraisals

1. Guideline Objective

The objective of this guideline is to briefly outline the methodology for implementing an urban participatory climate change adaptation appraisal (PCCAA). Through the voices of poor people themselves, this methodology identifies how severe weather associated with climate change directly or indirectly erodes their assets. The PCCAA includes the perceptions of community groups, small-businesses and households concerning the impacts of severe weather on their capital assets — physical, social, human and financial — as well as their perceptions of the role that local institutions play to assist them in building long-term resilience, protect their assets during severe weather and rebuild them after such events.

The use of participatory urban appraisal to understand local people's perceptions of their adaptation to climate-change related to severe weather is still in the early stages of development. Nevertheless this methodological guideline, based on recent field testing of a unique pro-poor climate change asset adaptation framework (Moser and Satterthwaite 2008; Moser 2009a), undertaken in Mombasa and Estelí, is intended to assist researchers wishing to undertake urban appraisals of the impacts of climate change on poor communities. Complementing the PCCAA, are two further components of urban climate change appraisals, namely a rapid risk and institutional appraisal (RRIA), and the consultation and validation of results. These two components are briefly mentioned in Box 1.1, and will be further elaborated in a subsequent working paper.

Box 1.1: Summary of urban climate change appraisal components

These comprise the following three methodological tools:

Participatory Climate Change Asset Adaptation Appraisal (PCCAA) uses participatory methodology to identify 'bottom up', both asset vulnerability to CC, as well as asset adaptation strategies to build long-term resilience, protect assets during adverse weather and rebuild them.

Rapid Risk and Institutional Appraisal (RRIA) provides a 'top down' review of the policy domain, in terms of the institutions tasked to deal with CC, the relevant national, regional, and municipal level policies, regulations and mandates relating to CC, as well as associated programs — and budgetary allocations.

Consultation/Validation of Results

The process of results validation depends on the level of commitment by different social actors. In Estelí an action planning exercise triangulated the results, allowing urban poor communities and public authorities to identify common problems, structure solutions, and negotiate collaboration. In Mombasa, consultation was more limited and prioritized an information sharing and capacity building event.

2. Contextual Background

a. Climate change

With climate change firmly established as a major global concern, urban centers in low and middle-income countries concentrate a large proportion of those most at risk from its effects for a number of reasons, including the following:

- A growing number of severe weather related disasters, although not 'proof of climate change' (which is difficult to ascertain) is proof of the vulnerability of cities and smaller settlements to severe weather events whose frequency and intensity climate change is likely to increase (Moser and Satterthwaite 2008).
- Low and middle-income countries not only have close to three-quarters of the world's population, they also have most of the urban population at greatest risk from the increased intensity and/or frequency of storms, flooding, landslides, heat waves and constraints on fresh water that climate change is already bringing, or will bring in the future.
- Rapid urbanization is perceived as increasing the impacts of climate change's possible effects in the context of urban poverty and inequality. Since 1950, the sevenfold population increase has brought an

increased concentration of people in low-lying coastal zones at risk from sea-level rise and severe weather events (McGranahan, Balk and Anderson 2007).

- A very high proportion of global deaths from disasters related to severe weather occur in these countries, with a large and growing proportion of such deaths in urban areas (UN Habitat 2007).

b. Hearing local people's voices and participatory methodology

Based on the recognition of the importance of hearing local people's voices and priorities, participatory methodologies were first developed by Robert Chambers (1994) and others undertaking participatory rural appraisals (PRA) of poverty.[34] Rather than individual or household questionnaires, participatory methodology is based on the purposive sampling from a range of focus groups that are representative of community members, in terms of age, gender, ethnicity, economic activities and other culturally specific variables. Since the introduction of a participatory methodology, over two a decade ago, it has been widely used, particularly for participatory poverty assessments undertaken in both rural and urban areas, with an extensive associated debate reflecting both the advantages and limitations of this methodology (see, for instance Brock and McGee 2002; Kanbur 2003; Holland and Campbell 2005).

The PCCAA methodology introduced in this working paper was adapted from earlier research by Caroline Moser, Cathy McIlwaine and other colleagues who modified PRA for use in urban contexts. This included the development of participatory urban appraisal (PUA) methodology specifically to understand local community perceptions of urban violence and insecurity, and its implementation in studies in cities in Jamaica, Colombia and Guatemala (Moser and Holland 1997; Moser and McIlwaine, 1999; 2004), as well as its use as a technique to build the capacity of women's organization in Colombia to participate in peace building processes (Moser, Acosta and Vasquez 2006).

Box1.2: Definition of the most important capital assets for individuals, households and communities

Physical capital: the stock of plant, equipment, infrastructure and other productive resources owned by individuals, the business sector or the country itself.

Financial capital: the financial resources available to people (savings, supplies of credit).

Human capital: investments in education, health and nutrition of individuals. Labor is linked to investments in human capital; health status influences people's capacity to work, and skill and education determine the returns from their labor.

Social capital: an intangible asset, defined as the rules, norms, obligations, reciprocity and trust embedded in social relations, social structures, and societies' institutional arrangements. It is embedded at the micro-institutional level (communities and households) as well as in the rules and regulations governing formalized institutions in the marketplace, political system and civil society.

Natural capital: the stock of environmentally provided assets such as soil, atmosphere, forests, minerals, water and wetlands. I n rural communities land is a critical productive asset for the poor; in urban areas, land for shelter is also a critical productive asset.

Sources: Bebbington (1999); Carney (1998); Narayan (1997); Portes (1998); Putnam (1993)

Turning to the issue of climate change, a community-level participatory approach at the micro-level is intended to provide insights into the experience of the impacts of severe weather among low-income groups in a way that macro-level analyses cannot do. A PCCAA not only allows poor groups to identify the extent to which climate change-related problems affect their communities, but also encourages them to assess their vulnerabilities as a consequence of climate change. Furthermore, such an approach assists in identifying interventions from the perspective of the poor, rather than from that of policy makers or academics. While all participatory appraisal methodologies share a number of common tools or techniques what can be

[34] As Chambers stated, participatory methodology is 'a growing field of approaches and methods to enable local (rural and urban) people to express, enhance, share and analyze their knowledge of life and conditions to plan and act' (1994: 953)

applied to different political, social, economic and environmental problems within urban contexts, at the same time such methodologies also need to be specifically adapted to address each particular concern, as in this case where the focus is specifically on the newly emerging problematic of climate change.[35]

c. Conceptual definitions: What is an asset?

An asset is identified as a "stock of financial, human, natural or social resources that can be acquired, developed, improved and transferred across generations. It generates flows or consumption, as well as additional stock" (Ford Foundation 2004). The concept of assets or capital endowments includes both tangible and intangible assets. The capital assets of the poor are most commonly identified as physical, financial, human, social and natural (see Box 1.2). In addition to these five assets, which are grounded in empirically measured research (Grootaert and Bastelaer 2002), additional intangible asset categories are in the process of being developed. These include "aspirational" (Appadurai 2004), psychological (Alsop, Bertelsen, and Holland 2006), political assets, most commonly associated with human rights (Moser 2007; Ferguson, Moser, and Norton 2007), and civic assets (Ginienievicz 2009). These intangible assets illustrate the growing importance of thinking outside the box and moving beyond well-established categories of capital assets.

3. The analytical framework and methodology for the PCCAA

This section introduces the analytical framework for the PCCAA and highlights a range of important methodological issues that are important for planning and implementing a PCCAA.

a. The analytical framework

The objective of the PCAAA is twofold; first to understand the **asset vulnerability** of poor households, businesses and community organizations as they relate to severe weather associated with climate change, and second to identify the types of **asset adaptation strategies** implemented by the same social actors to address this issue. To undertake research the PCCAA comprises the following two associated components:

i. An asset vulnerability analytical framework

This identifies the links between different vulnerabilities and the poor's capital assets. These relate both to external shocks and stresses, as well as to internal capacities to resist or withstand them. Vulnerabilities can include economic, political, social and psychological in nature and can affect different groups of the population, particularly women and children (see Moser and Satterthwaite 2010). In the Mombasa and Estelí studies, for instance, three types of vulnerability emerged as of particular importance;

- *Physical vulnerability* relating to the inadequate, or lack of provision of three types of physical infrastructure, sewerage, drainage and garbage collection, with the interrelationship presenting particular health related hazards
- *Legal vulnerability* linked to the lack of land tenure rights with implications for settlement location, lack of settlement planning and post-severe weather infrastructure support
- *Social vulnerability* of those groups most at risk to increasing intensity of severe weather.

ii. An asset-based adaptation operational framework

This explores and classifies the asset-based adaptation strategies as households, small businesses and communities exploit opportunities to develop resilience and resist, or to recover from, the negative effects of climate extremes. Three closely interrelated phases of asset-based adaptation were usefully identified.

- Asset adaptation to build long-term resilience
- Asset damage limitation and protection during severe weather events
- Asset rebuilding after severe weather and disasters

[35] See Moser and McIlwaine (1999) for an earlier guideline which describes the participatory methodology for appraisals of urban violence and insecurity.

For each phase of asset-based adaptation strategies required associated institutions that supported or undermined actions at household, community and government level require identification.

b. General principles and practices of participatory urban appraisal methodology

The research methodology is neither random nor arbitrary but builds on a well established set of principles and practices used in a range of earlier PUA studies (Chambers 1994; Norton 1998; Shah 1995). It is useful to briefly outline some of the generic methodology issues used in the PCCAA, before turning specifically to further methodological issues specific to the PCCAA.

i. Selection of researchers and local teams

First and foremost participatory research requires collaborative research partnerships with researchers (and their counterpart institutions) that have had hands-on research experience using PUA/PRA techniques, even if not specifically in relation to climate change. Another essential requirement is that such researchers can be 'gate-keepers' directly, or through close trust networks, to local poor communities. Finally it is these local researchers who have responsibility for identifying local fieldworkers that are capable and confident about undertaking participatory fieldwork in poor urban communities. Constructing research teams that can undertake PUAs requires skills in judging local capacities — and key to this is finding researchers, if not fieldworkers, already confident about working in slums and doing participatory fieldwork.

ii. The fieldwork process

Once all the preparation work is completed, following the same fieldwork process already used in many such participatory studies, the actual research is undertaken over a five week period. This breaks down into the following tasks:

- Week 1: Capacity building of local researchers to train them in the conceptual framework and participatory tools and techniques used in the study
- Week 2: Study of pilot community (see Box 4)
  Week 3 and 4: Study of 4 further communities (2 per research team)
- Week 5: Local researchers' analysis of data and completion of preliminary research results

This intensive five-week methodology requires the full-time commitment and **participation of all researchers,** who start with the first two weeks of training. However, only those that have satisfactorily completed the training requirements can take part in the research. Of critical importance is the piloting stage. As well as learning the techniques, this allows researchers to assess the participatory appraisal tools in terms of their applicability to the issue, in this case climate change, to practice their use, and to modify the methodology as considered necessary. The methodology also structures each day in the field so as to allow time both for undertaking focus groups as well as writing up daily notes. In the fifth week all the daily notes are compiled and analyzed, with the research process ending with a final workshop and presentation of preliminary findings.

Box 1.3: Training of local researchers

Training included the following:

- The theoretical foundation of participatory research techniques on urban poverty.
- Conceptual framework on community, household and local enterprise assets of the urban poor, and their adaptation to severe changes in climate and weather.
- Introduction to participatory research techniques appropriate for studying the urban poor's asset adaptation to climate change.
- Logistics needed for participatory research.

Training methods included the following:

- Short presentations, including videos, power points, on the theoretical and methodological frameworks.
- Role play, using participatory research methods
- Group discussions and plenary presentations
- Simulations, individual and group analysis.
- Preparation of the logistics required for the pilot including; the selection of neighborhoods; methodology for contacting organizations

iii. Research techniques

PUAs use a range of techniques or forums for discussing issues with community members. These include: group discussions; Semi-structured interviews (on a one-to-one basis); Direct observation; Ethno-histories and biographies (on a one-to-one basis); Local stories, portraits, and case studies.

However, **group discussions** are the most commonly used. This technique encourages extended analysis and conversation among community participants. The groups can range from 2 to 3 people to 25 to 30, although it is advisable to divide larger groups into sub groups of about 10 to 15. There are several types of groups that include the following, often overlapping groups:

- *Interest groups*—people in the community who share a common interest (occupational groups, religious groups, neighborhood gangs, Parent-Teachers Associations, sports groups).
- *Mixed groups*—people from all walks of life, representing the community as a whole.
- *Focus groups*—people convened to discuss a particular topic.

The composition of groups can vary by gender, with single-sex as well as mixed groups, by age and generation, with mixed-age groups and young, middle aged, and elderly groups, and by race and ethnicity, with mixed-race and ethnically uniform groups. Because perceptions often vary with these characteristics, it is important to identify the gender, age and ethnicity of all participants throughout the research. Women and men tend to identify different issues as do young and old.

The basic rules of participatory urban appraisal require discussants rather than the facilitator to determine the agenda, ensuring that the discussants themselves write or draw ('handing over the stick'), and encouraging visual rather than written or verbal accounts of situations or issues (Shah 1995). Triangulation is an important technique that comprises asking different groups the same questions. It not only provides a means of cross-checking but also helps to incorporate the views of different constituencies with influence over community organizations or key informants who may not live in the community, but have an in-depth knowledge of the area and its population. Members of different constituencies can participate in focus group discussions or in one-to-one, semi-structured interviews.

iv. Locations for conducting participatory urban appraisal in communities

There are two main ways of conducting a PUA in a community. Both methods have advantages and disadvantages, and a combination of the two is ideal. The first method is to carry out **'formal'** focus group discussions in a local community centre or communal building. This involves negotiating the use of the building with community leaders beforehand. It allows community members to come to the centre to participate in the research at pre-arranged times and is useful when working with large groups or with interest groups. However, conducting a participatory urban appraisal in a community centre risks excluding groups that normally do not participate in community activities.

The second method is to use participatory urban appraisal tools with **'informal'** focus groups, identified on the spot while walking through the community, as well as in shops, and bars, beside football pitches or basketball courts, or outside people's houses. This method allows greater flexibility and access to a more representative cross-section of community members, some of whom may be reluctant to go to a community centre. The main disadvantage is that groups can be very fluid, with people entering and leaving, and generally it is unlikely that those involved will commit as much time as in formally arranged groups.

v. Analysis of the research data

The research analysis can go through a number of stages. Often the in-country researchers start by producing a report, based on the daily field notes and the preliminary research findings of the fieldworkers. This data is then reworked, often going back to original focus group field notes by the commissioning research team. At this stage data is often quantified so as to provide representative information at the level of communities, or the aggregate

of communities within the city studied. This requires the numerical counting of such tools as listing, ranking and institutional maps (see below).

c. The application of data techniques for PCCAA

Along with the principles and practices of participatory methodology are a number of important issues specifically relating to data and techniques in undertaking a PCCAA, which are briefly summarized in this section.

i. Selection of cities and communities

The selection of cities is an important part of the participatory appraisal process with a number of criteria influencing selection. First, it is beneficial to move away from big cities to secondary cities. Not only have these been growing more rapidly in terms of population, densification, and economic growth, but in addition the focus on climate change issues to date has tended to prioritize capital cities. Second, selected cities must already be recognized as 'at risk' to climate change hazards. For instance, as a coastal city, Mombasa is prone to flooding, while Estelí has experiences the impacts of climate change as flooding and drought. Finally, researchers need to select cities where they have, or can identify, appropriate research partner institutions committed to the study and with contacts with local public authorities, civil society organizations and local researchers. This ensures that recommendations from the study have a realistic potential of implementation by municipal authorities or other local institutions.

Within the city it is then necessary to identify communities for the study. This involves site visits walking through communities together with the local researchers to a number of different localities to assess suitability. It is important to ensure that communities are both poor and at risk to climate change. Housing standards and the level of service provision provide useful proxy indicators of poverty levels.

Local organizations and leaders, and in some cases, local municipalities, are crucial in gaining access to communities and reaching agreement about undertaking a PCCAA. This requires building relationships with local organizations, leaders or other institutions with a presence in a given community. The process of identifying research communities varies according to the context. For example, in Mombasa, researchers established contacts with a local NGO and through it with community based organizations (CBOs) in a 'bottom-up' process. Once the research objectives had been explained and the CBOs commitment gained, they assisted in identifying local community researchers as well as facilities for training, daily report back sessions, and final analysis. In contrast more of a 'top down' process was used to identify research communities in Estelí. The Mayor and his technical staff lead consultations together with the Institute for Applied Research and Local Development (NITLAPAN). A combined team conducted overview visits to different neighborhoods in the city, and then analyzed municipal data in terms of poverty, risk vulnerability and infrastructure levels. The team then selected four neighborhoods as representative of those areas most at risk to severe weather.

ii. Community profile

Prior to entering a community it is useful to elicit some basic characteristics. One method is to request the counterpart organizations to construct a simple community profile with basic descriptive information on the community and its resources. This needs to include demographic and social data—location, geographic characteristics, a brief history, population size, number of dwellings, ethnic population, predominant household structures. Information on economic activities is also required—major income sources, access to credit, land tenure, community infrastructure and facilities such as water, electricity, sanitation, schools, and health posts. The information for the profile can be collected from secondary sources, such as census data and household surveys and other studies of the community, and from other sources.

4. Research themes and associated techniques for participatory climate change asset adaptation appraisal

a. Introduction

A PCCAA addresses a series of themes, each with a range of associated tools for eliciting information. Themes are derived from the background contextual discussions and analysis of the asset vulnerability, asset adaptation and climate change nexus. These include the following:

i. **Community characteristics**: Background identification of the most salient community's general characteristics.
ii. **Severe weather related to climate change**: Identification of types of severe weather, the history of a community in relation to changes in severe weather over time and other general problems.
iii. **Vulnerability to severe weather**: Identification of vulnerable groups, areas and assets, affected by severe weather associated with climate change.
iv. **Asset adaptation**: Identification of assets (at household, small business and community level) and strategies and solutions of asset adaptation to climate change.
v. **Institutions:** Identification of institutions and their importance in adaptation to climate change.

The selection of tools used depends on the context of the discussions; it is neither necessary nor possible to implement all the tools in a given group discussion. As mentioned above, the basic rule of participatory urban appraisal ensures that discussants rather than the facilitator determine the agenda, discussants themselves write or draw ('handing over the stick'), and that visual rather than written or verbal accounts of situations or issues are encouraged. The tools can be modified according to issue and context. In Kenya and Nicaragua researchers and discussants made innovative changes to the basic sets of tools to address specific issues relating to climate change. Where relevant, these innovations are included below. The structure of this section is as follows:

- Description of each research theme.
- Identification of potential tools for eliciting information on the associated theme.

b. The PCCAA Themes and Tools

i. Community characteristics

Information on community characteristics forms the foundation of a PCCAA. The tools for gathering this information should be implemented at the beginning of the appraisal to establish the context at the outset (Tool box 1). In particular, the transect walk should be carried out with community leaders, on initial entry into the community. This high-profile walk not only dispels suspicion of outsiders, but also informs researchers of areas that have greater vulnerability to severe weather.

The matrix on general data is most usefully conducted with community leaders or people who have lived in the community for a long time. Unlike many of the other tools, this matrix needs to be implemented only once or twice, at the beginning of the research. For ease of implementation it can be combined with the matrix on social organization. This tool is most effective when the matrix is displayed in a position where all participants can view it — such as a wall, table or floor as it encourages all participants to contribute.

Tool Box 1: Potential tools for eliciting information on community characteristics

Tool	*Function*
Transect walk	• Helps break ice—critically important to dispel suspicion of outsiders • Mechanism for first informal contact with a range of community members • Visual identification of areas most vulnerable to severe weather
Matrix on general data	• Provides information about the community • Covers population, infrastructure, source of income by gender, family size and division of labor, migration, communications, and ethnic groups
Participatory mapping of: ▪ ***Barrio* or community** ▪ **Areas affected by severe weather**	• Maps spatial characteristics of a community (can be combined with the transect walk) • Maps the most important features of the community, such as boundaries, houses, roads, police stations, health posts, and schools • Identifies areas vulnerable to, or affected by, severe weather associated with climate change

Severe weather related to climate change

The next step in the PCCAA process involves gathering information on how climate is experienced within a community. This includes identification of types of severe weather, the history of a community, changes in severe weather over time and associated general problems. There are several tools which can be used to carry out this stage, as identified in tool box 2.

Tool box 2: Gathering information on the climate in a community

Tool	*Function*
Listing and Ranking	• Listings identify perceptions of types of severe weather • Ranking then prioritize which most affect local communities
Matrix of history of the community	• Details the history of the community • Identifies periods of climate change-related events and their affects on a community
Time line or seasonality analysis (trend analysis)	• Provides visual representation of types of weather change and associated problems — such as severe droughts (water scarcity), issues around food insecurity, heat waves, floods, and disease cycles.

Unlike other participatory urban appraisal, the PCCAA does **not** start with the listing and ranking of generally problems, but starts directly with the issue of weather using these tools to ascertain how communities list and rank severe. The reason for not starting with general problem listings relates to the complexity of research severe weather. Unlike well-established problems such as violence (see Moser and McIlwaine 1999), the slow invidious changes of weather may not considered a priority problem by communities in comparison to other basic needs. This could well result in an extensive amount of time spent on problem listings and rankings of other problems. While interesting in themselves, they may not provide the necessary entry point to then address the issue of weather.

Therefore it is necessary to start by asking focus groups to **list, and then rank** their perceptions as to which types of weather most impact on their lives. Here it is critical that researchers do not use the terms 'climate change' as this is a contested concept which is yet to be concretely defined; it is also a term with which the urban poor may be unfamiliar. The term 'disaster' should also be avoided as researchers want to investigate the slow incremental effects of climate change, not solely extreme climatic events. Instead, words such as 'weather' and 'seasons' should be adopted using local language and terminology. Once the simple listing and ranking of weather has been achieved, a range of additional tools can broaden an understanding of the complexities of weather.

Time lines allow for more specific understanding as to how weather has changed over time, or how different types of weather have become more or less important according to the perception of the urban poor. Such time lines are best undertaken with elderly or established members with an in depth knowledge of change over time. The tool may vary, depending on the time frame. For examples, time lines can be used to examine changes over a day, a week, a month, a year or a range of years. While time lines provide important visual tools, **matrices of the history of the community** can provide considerable information. In some cultural contexts, these have proved to be excellent 'ice breaker' and a good entry point for group discussions.

ii. Vulnerability to severe weather

Once the types of severe weather that affect communities have been identified, the next important stage is to focus specifically on the issue of vulnerability. This includes the identification of vulnerable groups, spatial areas and social and economic assets, vulnerable to severe weather associated with climate change. Again a range of participatory tools, as shown in Tool box 3, are useful to ascertain different types of information from focus groups. Some of these, such as maps and time lines, are similar to those identified for the identification of severe weather; while others such as causal flow diagrams, trend matrices and problem trees are more specifically focused on identifying the types of sever weather vulnerability.

Tool box 3: Investigating vulnerability to severe weather

Tool	*Function*
Community maps	• Identifies vulnerable areas and locations within a community • Identifies the type of vulnerability (flooding, heat, water clogging)
Severe weather/climate change/disaster time lines	• Identifies the affects of severe weather on individuals and household, small business and community level over a period of time
Causal flow diagram	• Identifies main causes and consequences of severe weather associated vulnerability (*with the size of the circles indicating their importance)* • Relationship between climate induced disasters and loss of assets (i.e. flood, drainage clogging, late attendance in school, outbreak of diseases) • Indirect effects arising from assets being affected (i.e. people's health from contaminated water)
Problem Tree	• Analyses causes (in the roots) and effects (in the branches) of particular types of severe weather

Community maps not only identify spatially vulnerable areas and physical vulnerability relating to inadequate drainage, sewerage and garbage collection. It also provides an entry point for identifying the extent to which the lack of legal land rights (which can be termed politico-legal vulnerability), makes some households particularly vulnerable, as well as their relationships to other types of vulnerability.

Causal flow diagrams can be used to identify the causes and consequences of asset vulnerability and the extent to which these are linked to climate change. In addition, they can identify the nature of networks of relationships among neighbors for lending money, providing child care, and so on. This tool can also be used to assess the relationship between severe weather and such factors as employment, education and health.

iii. Asset adaptation to severe weather

One of the most critical components of the PCCAA relates to the identification of asset adaptation strategies at household, small business and community level, and their associated sources of resilience. This is undertaken in two stages; first listings and rankings identify the assets considered most important by the three different groups; and second, matrices assist in elaborating strategies, and potential and actual solutions to adapt assets to severe weather associated with climate change. Here an important time-related distinction is made between the following:

- Before: Actions to strengthen sources of resilience.
- During: Actions implemented during the period of acute weather.
- After: Actions designed to address rebuilding after the acute weather condition has abated.

It is important to recognize that responses may not be large scale, highly visible interventions, but rather a range of small, modest, incremental activities designed to build resilience against, or respond to, the onset of increasingly recurrent patterns of severe weather. Several tools can be useful in this stage, including listings and rankings, matrices and causal flow diagrams. As shown below, there is some overlap, with the same tools used for different purposes. Nevertheless, the examples below provide illustrations of those considered most useful to identify different issues relating to sources of asset resilience.

Tool box 4: Identifying assets and assets adaptation

Tool	*Function*
Listings and Rankings	• Identifies assets and perceptions of levels of importance at household, small business and community level • Identifies adaptive strategies as identified by different groups and prioritization of effective strategies
Matrices	• Identifies assets of different groups • Identifies potential and actual strategies and solutions to adapt specific assets to severe weather • Identifies solutions offered by different groups
Causal flow diagram	• Identifies the impacts and consequences of different types of severe weather on assets • Identifies possible strategies and solutions to adapt specific assets to severe weather by different groups
Community maps	• Location of community assets
Timelines	• Identification of strategies over time

The first task in this stage of the PCCAA is to list and then rank assets. This identifies assets as well as the level of importance of each as perceived by local residents. Then rankings are undertaken with such listings and rankings, undertaken with all three groups, households, local businesses and community groups providing the requisite information for then asking focus groups to identify their perceptions of the most intervention before, during and after severe weather. Finally, causal flow diagrams can be used not only to show causes and effects of vulnerability, as described in the previous section, but also as a very effective visual tool to identify the relationship between a weather related problem and solutions to address it.

iv. Institutions supporting local adaptation

The final stage in the PCCAA is the identification of local institutions in terms of their importance and support to local communities when experiencing severe weather associated with climate change. As with the previous stage, this is a two phase process. Focus groups first identify institutions that are perceived to be important generally in local communities. Institutional (or Venn) mapping is an important tool for focus groups to identify three aspects:

- Spatial location (inside or outside the community) — indicated by whether they are located inside or outside the circle.
- Relative importance — indicated by the size of the circle.
- Perceived as positive or negative — with focus groups members identifying them as positive or negative (or even ranking them in this way).

Second, focus groups then identify those institutions that particularly assist local communities in building resilience or responding to severe weather. This allows focus groups to recognize that these are not always the same institutions as those identified in the first institutional mapping exercise. Listing and ranking tools assist in prioritizing those that are most important while matrices can be used to identify institutional strategies and solutions. The different tools are identified below (Tool box 5).

Tool box 5: Identifying the importance of institutions supporting local adaptation

Tool	*Function*
Institutional/Venn mapping	• Identified the comparative importance of institutions • Identifies whether institutions are located inside or outside the community • Identifies whether institutions are positive or negative • Identifies the importance of institutions in adapting to severe weather • Identifies whether there are relationship/linkages between institutions
Listing and ranking	• Identifies institutions inside and outside of a community • Categorizes the institutions by type i.e. NGO, CBO, Local government, National government. • Ranks institutions by importance
Matrix	• Identifies the level of importance of the institution in general and in adapting to severe weather • Identifies the institutions inside and outside of a community

Local institutional support can range from informal associations to formal state and religious institutions. However, those identified as important in local communities do not necessarily assist them in building resilience or responding to severe weather.

5. Summary of participatory climate change adaptation appraisal tools

While there are no set rules on the number of tools that should be used when conducting a PCCAA, recent research in Kenya and Nicaragua showed the utility of providing a list of tools and a recommended number of exercises to be done in a community in a one-week period. Although the imposition of particular tools and the number of exercises is somewhat deterministic and therefore has drawbacks, nevertheless it is particularly useful in projects where research teams work simultaneously in a large number of communities. Furthermore, because it produces a consistent set of information, it makes cross-community comparisons considerably easier. Tool box 6 lists the basic tools for a PCCAA and the recommended number of exercises to be applied in a one week period. The list serves only as a guideline; other tools can be implemented, depending on the context.

Tool box 6: Summary of main tools for a PCCAA and recommended number of exercises

Tool	***Number of exercises***
Map of the community	1–5
Map of areas most affected by severe weather in the community	5
Matrices of general community information	1–2
Matrices of history of the community	1-2
Listing and ranking of types of severe weather[36]	15–20
Map of institutional relationships	3–5
Matrix of trends on types of severe weather	5–10
Weather Timeline – daily, weekly, monthly	3–5
Weather Timeline – yearly and long-term	3–5
Causal flow diagram of severe weather-related problems	10–15
Listing and ranking of assets	15–20
Listing and ranking of coping strategies before, during and after severe weather	10–15
Diagram of strategies to cope with severe weather	5–7
Listing of solutions to build resilience before during and after severe weather	10–15

[36] Although listings and rankings are two exercises, the second follows on from the first and therefore these are itemized together.

6. Preliminary analysis of PCCAA: The issue of quantification

While a detailed description of the analysis of PCCAA data goes beyond the scope of this annex, it is useful to point to the fact that it can take two forms. First, it can identify broad patterns from in-depth content analysis of the focus group exercises. These can then be illustrated using the most appropriate tools. Second, in order to move beyond individual focus group experiences at the analysis stage it may be useful to quantify some of the information. While the quantification of participatory data presents particular challenges as to its representativeness (see Moser 2002), nevertheless it can assist is providing strong messages particularly to policy makers who have a tendency to dismiss such work as anecdotal.

In the PCCAA in both Mombasa and Estelí, all focus groups all used the same tools when addressing each issue. This meant that those tools lending themselves to quantification, such as ranking and listings, could therefore produce quantitative results — as well as cross city comparisons. It is important to stress that quantification depends on focus groups using exactly the same tools or the data will not be compatible — hence the importance of training. Using the total number of listings (the number of times a listing was conducted) as the universe, it was possible to conduct some basic statistical analysis. Equally information gained from rankings could be quantified — using the prescribed participatory methodology on ranking information (3 for first priority, 2 for second and 1 for third) (See Moser 2002). While this data was only representative for the focus groups, nevertheless it assisted in showing the broader picture.[37] The following section briefly describes the focus group results most suitable for quantification:

a. Quantification of listings and rankings of weather: As shown in Table 6 in the main text, listings and rankings from participatory focus groups in both cities were useful to show similar perceptions of severe.

b. Quantification of listings of asset actions before, during and after severe weather: The same methodology was used in this case to list actions, quantified in terms of the total number of asset adaptation matrices. Table 7, in the main text, shows how in Mombasa, the majority of households, small business and community groups were resourceful at developing a range of resilience measures. Yet within the community there were also slight differences among different groups.

c. Quantification of listing and ranking of assets: This exercise again helps identify those assets considered as priorities by households, small-scale business and communities. In Mombasa, the totals taken from asset listings and rankings, shows that housing, followed by health, was the most highly prioritized asset, whether owned by individual households or by business owners (see table 8).

d. Quantification of institutional maps: Institutions important in the community can be numerically quantified in terms of the number of times they appear in the institutional maps. In Mombasa, for instance, focus groups first identified institutions that were perceived to be important generally in local communities, located them either inside or outside the community, and identified were perceived as positive or negative. The same focus groups then identified those institutions that particularly assisted local communities in adapting or responding to severe weather. This allowed for the quantitative, comparative identification of those institutions important in the community, and the extent to which the same institutions were, or were not, important in adapting to weather. In Table 16, in the main text, the first number in each column indicates the order of importance from first to third, with the numbers in brackets the absolute numbers. This result shows that institutions considered important by community members were not necessarily the same as those they perceived as assisting them in relation to severe weather. While local government representatives such as chiefs and elders were identified as important local institutions, they did not take an active role in dealing with severe weather problems, except in one community.

7. Concluding comment

The limited number of PCCAAs means that to date researchers conducting such appraisals have had little experience on which to draw. While recognising that participatory appraisals are inherently flexible and should be guided by the people in the research communities, this paper provides some basic guidelines. It provides a useful starting point for designing research and a way of systematising analysis. It also shows that some participatory urban appraisal tools are more suitable for exploring climate change than others. Thus while the guidelines are

[37] For other examples of quantification of focus groups, see Moser and McIlwaine (2004b).

entirely flexible and based only on a potential range of tools, it is hoped that they will assist researchers seeking to undertake research in this area.

ANNEX II

Climate Projections Relevant to Mombasa and Estelí

1. Mombasa

Projections available for Kenya or the East African region agree on the expected increase of temperature. Regional averages of near surface temperature projections in IPCC Fourth Assessment Report (AR4) from a set of 21 global climate models (GCMs) for A1B scenario show 3.1°C to 3.4°C increase in the seasonal median temperatures in East Africa with an annual median temperature increase of 3.2°C between the years 2080 to 2099 and the years 1980 to 1999.[38] Kenya anticipates an increase in temperature from 0.5°C to 3°C by 2030 with the doubling of carbon dioxide. The changes vary depending on seasonality and locations.[39]

Projections are based on several GCM models listed in Table 1 below. All models indicated increasing temperature changes at all locations with doubling of carbon dioxide.

Table 2.1: The GCMs used for Climate Change Study in Kenya's First National Communication on Climate Change

Table 5.1: The GCMs available for Climate Change Study

Climate Model	Model Resolution (Latitude - Longitude)		Levels	Temp. Change (°C)
GISS 1	7.83	10.0	9	4.2
GISS 2	3.90	5.00	12-18	-
GFDL 1	2.22	3.75	9	4.0
GFDL 2	2.22	3.75	14	3.2
UKMO 1	2.50	3.75	11	3.5
NCAR T42	2.81	2.81	18	-
CCC T32	3.75	3.75	10	3.5
GERMAN 1	5.63	5.63	19	2.6
UKMO 2	2.50	3.80	19	2.70
GERMAN 2	5.60	5.60	19	2.6
GDFL 3	4.44	7.50	9	4.0

Notation: **GISS** - *GORDAD Institute for Space Science*
UKMO - UK met Office
CCC - Canadian Climate Model
GDFL - Geophysical Fluid Dynamics Laboratory
NCAR - National Center for Atmospheric Research

According to IPCC Fourth Assessment Report, sea level is projected to rise in the range of 0.18 meters (B1 scenario) and 0.59 meters (A1F1 scenario) at the period 2090-2099 relative to 1980-1999.[40] With a rise in the sea level of only 0.3 meters, it is estimated that about 17% of Mombasa or 4,600 ha of land area will be submerged.

There is less confidence in local projections on precipitation as well as extreme events such as floods, droughts and storm surges which can vary depending on local climate variables. At least 14 out of 21 global models agree that in

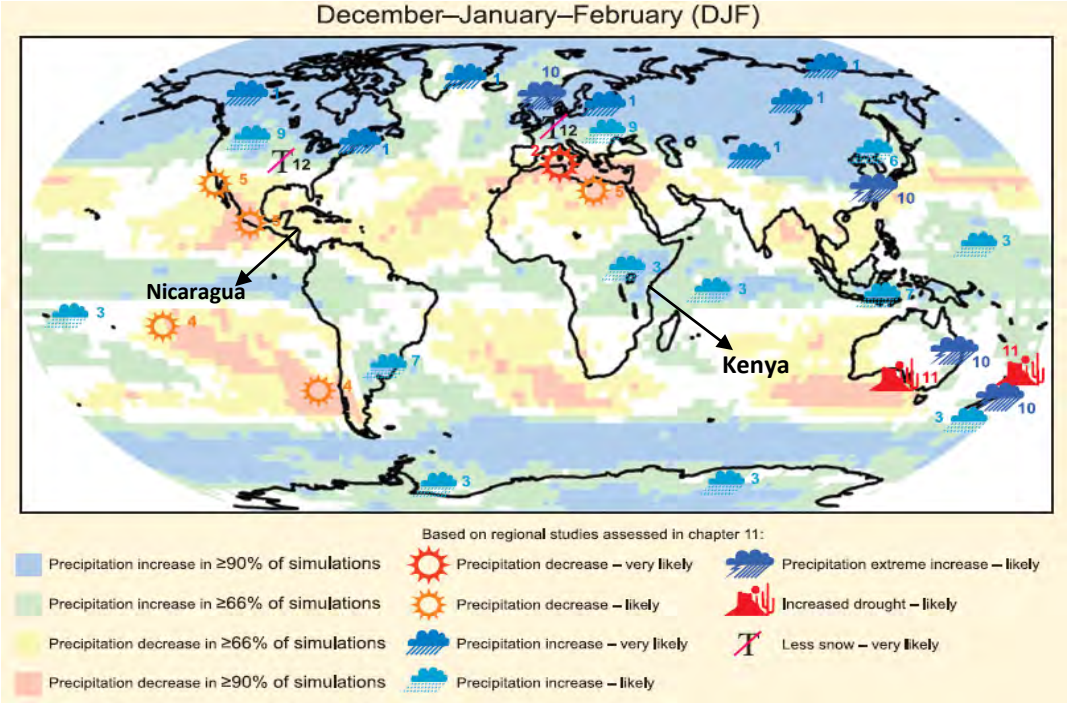
[38] Christensen et al. 2007. Table 11.1, p. 854. East Africa is denoted as EAF in the table.
[39] NC-Kenya, 2002, p. 39.
[40] IPCC 2007, p. 13

East Africa, the number of extremely wet seasons increases to roughly 30 percent.[41] This means that 3 in 10 of the seasons are extremely wet in East Africa. Increase in the frequency of extremely warm seasons is 100%.[42]

As far as precipitation, 18 out of 21 models presented by Christensen et al. (2007) project an increase in rainfall for the East African region; Hewitson and Crane (2006) also show a predicted increase in rainfall for East Africa especially in the June-July-August season under SRES A2 scenario. Milly et al. (2005) present 12 climate models, projecting 10-40% increase in runoff in eastern equatorial Africa. Rainfall scenarios over Kenya for the year 2030 using the Canadian Climate Center Model (CCCM), however, show a decrease in annual rainfall throughout the country except the region extending from Lake Victoria to the central highlands east of the Rift Valley.[43]

The figure below shows predicted changes in precipitation based on 21 Atmospheric Ocean General Circulation models for the IPCC Fourth Assessment Report, using A1B scenario and comparing the period 2080-2099 with the control period 1980-1999. The results roughly indicate a likely increase in precipitation for the Kenya region (≥ 90%) and a likely precipitation decrease in the region of Nicaragua (≥66% of simulations).

Figure 2.1: Predicted changes in precipitation based on 21 Atmospheric Ocean General Circulation models for the IPCC Fourth Assessment Report (A1B scenario)



Source: Christensen et.al. 2007

Exposure to adverse weather in Mombasa is likely to be mostly in the form of gradual weather change (increase in temperature and dryness, increase in the intensity of winds as shown above) and less so in the form of extreme events. A recent study by Kebede et al (2009) on Mombasa's exposure of economic assets to flooding, estimates 1 in 100 year extreme water levels or storm surge (equaling 3.624 meters along the coast of the Mombasa district) without cyclones. According to this study, Mombasa is not expected to experience a landfall of tropical storms in the future and the storm surge regime is considered to remain constant. Similarly, human-induced subsidence is currently not reported as an issue in Mombasa and based on current sea level measurements and the district's

[41] Christensen et al., 2007. Table 11.1. Page 854
[42] Christensen et al., 2007. Table 11.1. Page 854
[43] NC-Kenya, 2002., Page 39-40

geology, this is unlikely to change. Sea level rise measured at Mombasa station between 1986 and 2004 showed an average of 1.1 mm annual rise, comparable to the global expected sea level rise of 1.7 mm/year (Kebede 2009; Meehl et al. 2007).

2. Estelí

During the preparation of Nicaragua's First National Communication on Climate Change (Nicaragua NC), the model MAGICC was used to generate emission scenarios of greenhouse gases and SCENGEN model was used for generating climate scenarios for Nicaragua. Both models were developed by the University of East Anglia, UK. The future spatial and temporal patterns of climate in Nicaragua were obtained by using general circulation models such as HADCM2 linked with the model outputs MAGICC.[44]

The climate scenarios used in Nicaragua NC are based on the IPCC emissions scenarios: IS-92A, IS-IS-92c and 92d (pessimistic, moderate and optimistic, respectively). The time horizons selected were 2010, 2030, 2050, 2070 and 2100. The projections were made with respect to the climatic series 1961-1990, used extensively by the World Meteorological Organization.[45]

The results of simulations of climate on the territory of the Republic of Nicaragua show the variations of the main features of weather (temperature, precipitation and cloudiness) for each GHG emissions scenario for the 21st century for three time horizons on the Pacific and Atlantic slopes of Nicaragua.[46]

Temperature:
According to IPCC Fourth Assessment Report, all of Central America is very likely to warm during this century. The annual mean warming is likely to be larger than the global mean warming.[47] The annual mean warming under the A1B scenario between 1980 to 1999 and 2080 to 2099 varies in the Central America region from 1.8°C to 5.0°C, with half of the models within 2.6°C to 3.6°C and a median of 3.2°C[48]. Seasonal variation in Central America mean warming is relatively high, with a difference of 1°C in median values between December-January-February (DJF) and March-April-May (MAM).[49]

Climate change scenarios for the Pacific and Atlantic slopes of Nicaragua based on the IPCC emissions scenarios show that the temperature will increase in both regions. The increase in the Pacific region ranges from 2.1°C to 3.7°C by 2100, while on the Atlantic/Caribbean side, the temperature is projected to increase by 1.9°C to3.3°C by 2100, depending on the optimistic to more pessimistic scenarios.[50]

Based on the IPCC scenarios, the Ministry of Environment and Natural Resources (MARENA) estimated that, by 2020-2029, the average temperature in Nicaragua is projected to increase by 0.5°C and 1°C for the positive scenarios (A1B) and 4°C to 4.5°C for the more pessimistic scenarios (A2). It is estimated that the average temperature in Nicaragua could increase by 0.4°C by 2020 and up to 1.2°C by 2050 (A2).[51]

Precipitation:
Also according to the IPCC Fourth Assessment Report, annual mean precipitation is likely to decrease in Central America[52].

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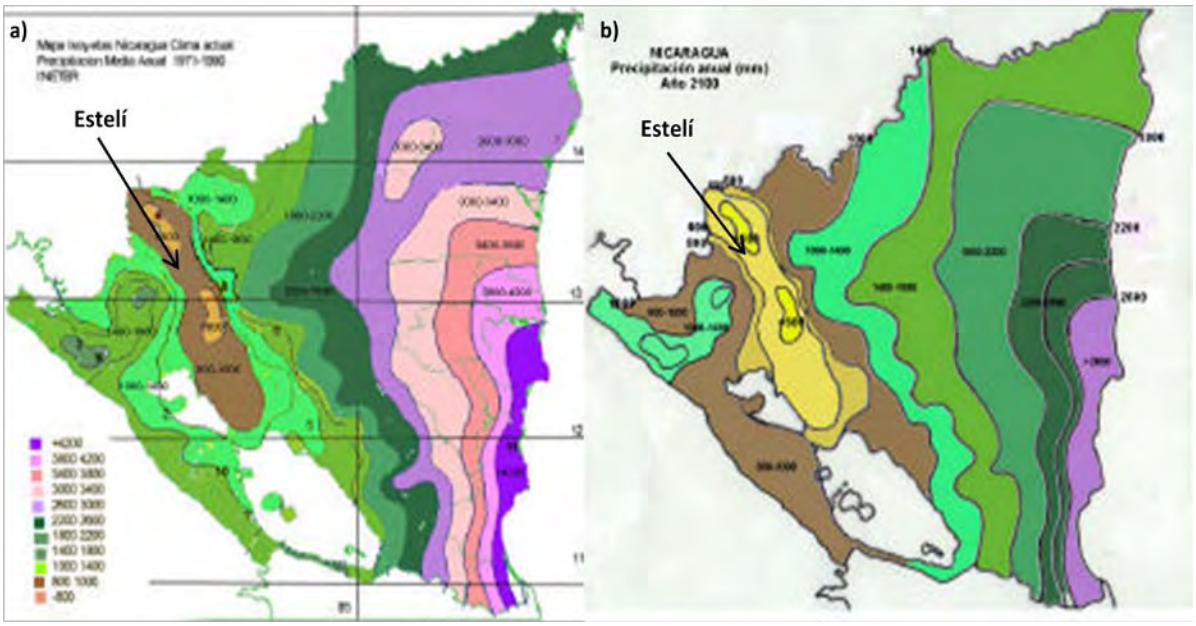
[44] NC-Nicaragua, 2001. Page 41-42
[45] NC-Nicaragua, 2001. Page 42
[46] NC-Nicaragua, 2001. Page 42
[47] Christensen et al. 2007 Page 892
[48] Christensen et al. 2007. Page 894
[49] Christensen et al. 2007. Page 894
[50] NC-Nicaragua, 2001. Page 5, Cuadro 1.2.
[51] RRIA Report. Pérez, F. J., Lorio, G. M., and Vance, I. 2010. Diagnóstico Institucional Y De Riesgos A Nivel De La Ciudad De Estelí (RRIA). Page 15
[52] Christensen et al. 2007. Page 860

The multi-model data (MMD) models suggest a general decrease in precipitation over most of Central America, consistent with Neelin et al. (2006), where the median annual change by the end of the 21st century is –9 percent under the A1B scenario, and half of the models project area mean changes from -16 to –5 percent, although the full range of the projections extends from –48 to 9 percent. Area mean precipitation in Central America decreases in most models in all seasons.[53]

The current spatial distribution of field and simulated average annual rainfall in Nicaragua is presented in Map 1b. Comparing the current distribution of mean annual precipitation and the possible distribution for the year 2100 (pessimistic scenario) shows that the country would be a significant reduction in the annual totals. By 2100 the reductions are quite similar for both sides. On the Caribbean slope is about 35.7% and 36.6% Pacific.[54]

The most significant changes are expected in regions that currently are relatively dry, as the northern territory and the northern municipalities of Chinandega and Leon. With changing climate conditions these areas would receive less than 500 mm annually, which would have significant impact on farming activities. In most of the Central and Southern Pacific region annual rainfall could decrease from 1400-1800 mm to 800-1000 mm, gradually increasing the dry area of Nicaragua.[55] The cloud cover is also expected to decrease in both the Pacific and Atlantic slopes of Nicaragua.

Figure 2.2: a) Average annual precipitation in current climate conditions in mm. b) Average annual precipitation simulated for the year 2100 (pessimistic scenario).



Source: NC-Nicaragua, 2001. Page 44. Mapa 4.2.

Decrease in precipitation in the Pacific ranges from 21% to 36.6% by 2100, whereas in the Caribbean precipitation is projected to decrease by 20.5% to 35.7% by 2100 depending on the optimistic to more pessimistic scenarios (see Table 2).[56]

[53] Christensen et al. 2007. Page 894-895
[54] NC-Nicaragua, 2001. Page 43
[55] NC-Nicaragua, 2001. Page 44
[56] NC-Nicaragua, 2001. Page 5, Cuadro 1.2.

As rainfall in the period 2020-2050 is expected that these are reduced between 1.08% and 4.3% (B2) in an intermediate stage between 1.2 and 4.4% in the A2. For 2100 is expected to decrease between 8.2% (B2) and 11.5% (A2).[57]

Table 2.2: Climate projections for Nicaragua (precipitation, temperature and cloudiness) for the 21st century

Time horizon	Scenarios					
	Pessimistic IS-92a		Moderate IS-92d		Optimistic IS-92c	
	Pacific	Caribbean	Pacific	Caribbean	Pacific	Caribbean
Precipitation in %						
2010	-8.4	-8.2	-7.9	-7.7	-7.9	-7.7
2050	-21.0	-20.5	-16.9	-16.5	-16.2	-15.8
2100	-36.6	-35.7	-25.3	-24.7	-21.0	-20.5
Temperature in °C						
2010	0.9	0.8	0.8	0.7	0.8	0.7
2050	2.1	1.9	1.7	1.5	1.6	1.5
2100	3.7	3.3	2.6	2.3	2.1	1.9
Cloudiness in %						
2010	-3.6	-4.0	-3.4	-3.7	-3.4	-3.7
2050	-9.0	-9.9	-7.2	-7.9	-6.9	-7.6
2100	-15.6	-17.2	-10.8	-11.9	-9.0	-9.9

Source: NC-Nicaragua, 2001. Page 5

[57] RRIA Report. Pérej, F. J., Lorio, G. M., and Vance, I. 2010. Diagnóstico Institucional Y De Riesgos A Nivel De La Ciudad De Estelí (RRIA). Page 15

ANNEX III

Summary of Differences between Climate Change Adaptation and Disaster Risk Management

DIFFERENCES		SIGNS OF CONVERGENCE
Disaster Risk Reduction/ Disaster Risk Management	**Climate Change Adaptation**	
Relevant to all hazard types	Relevant to climate-related hazards	N/A
Origin and culture in humanitarian assistance following a disaster	Origin and culture in scientific theory	Climate change adaptation specialists now being recruited from engineering, water, sanitation, agriculture, health, and disaster sectors.
Most concerned with the present i.e. addressing existing risks	Most concerned with the future — i.e. addressing uncertainty/new risk	DRR increasingly forward-looking. Existing climate variability is an entry point for climate change adaptation.
Historical perspective	Future perspective	As above
Traditional/indigenous knowledge at community level is a basis for resilience	Traditional/indigenous knowledge at community level may be insufficient for resilience against types and scales of risk yet to be experienced	Examples where integration of scientific knowledge & traditional knowledge for DRR provides learning opportunities.
Structural measures designed for safety levels modeled on current and historical evidence.	Structural measures designed for safety levels modeled on current and historical evidence and predicted changes	DRR increasingly forward-looking
Traditional focus on vulnerability reduction	Traditional focus on physical exposure	N/A
Community-based process stemming from experience	Community-based process stemming from policy agenda	N/A
Practical application at local level	Theoretical application at local level	Climate change adaptation gaining experience through practical local application
Full range of established and developing tools (e.g. early warning systems, seasonal climate forecasts & outlooks, insurance & related financial risk management, building design codes & standards etc)	Limited range of tools under development	None, except increasing recognition that more adaptation tools are needed
Incremental development	New and emerging agenda	N/A
Political and widespread recognition often quite weak	Political and widespread recognition increasingly strong	None, except that climate related disaster events are now more likely to be analyzed and debated with reference to climate change
Funding streams ad hoc and insufficient	Funding streams sizeable and increasing	DRR community engaging in climate change adaptation funding mechanism.

Source: Tearfund 2008.

ANNEX IV

Ranking of Business Assets in Mombasa and Estelí and of Collective Assets in Mombasa

Table 4.1: Composite matrix of business assets and their ranking in the four study sites of Mombasa

Type of Assets	Ranking	Totals	%
Wanachama (members)	II II	4	4.5
Savings	I	1	1
Jamii (community)	III	3	4
Boat & Motorbike	III III	6	7
Nyumba (store)	I	1	1
Machinery (sewing, fishing gear, handcarts)	III III II II IIII	14	17
Customers	II I II I I	7	8
Stock & source of stock, materials & mbao (wood)	I III I III I IIIII III II	19	23
Lorry & Owner of Lorry	III I	4	4.5
Petrol	II II	4	4.5
Human capital and Heath	I III III II III	12	14
Housing	II III I	6	7
Business	III	3	4
Total		**84**	**100**

NB: Stock appears to be the first most important business asset identified by the participants in all the study sites. Machinery is the second most important and the third most important business asset is human capital and health.

Table 4.2: Composite matrix of business assets and their ranking in the four study sites of Estelí

Type of Asset	Monte Sinai	Miguel Alonso	29 de Octubre	Belen	Total	%
Kitchen			✓		1	4
Furniture				✓	1	4
Clothes			✓		1	4
Stock & source of stock, materials & wood	✓	✓	✓	✓	4	17
Equipment and Work Tools	✓	✓	✓	✓	4	17
Latrines			✓	✓	2	8
Business and Customers	✓	✓	✓	✓	4	17
The Streets	✓				1	4
Income	✓				1	4
The Natural Environment (Trees, Rivers)			✓		1	4
Bicycle				✓	1	4
Time				✓	1	4
Social Relationships		✓			1	4
Liquid Finance		✓			1	4
Total					**24**	**100**

NB: The most important business assets identified by the participants in all four study sites appear to be stock, equipment, business, housing and health.

Table 4.3: Matrix of business asset-based adaptation strategies from the four study site of Mombasa

Name of community	No. focus groups	No. focus groups with business asset matrix	Type	Actions			Some Actions
				Before	During	After	
Bofu	17	6	Carpenters	✓	✓	✓	Yes
			Transporter (Lorry drivers)	✓	✓	✓	Yes
			Tailors	✓	✓	✓	Yes
			Fishermen	✓	✓	✓	Yes
			Motorbike	✓	✓	✓	Yes
			Youth Group	✓	✓	✓	Yes
Ziwa laNgombe	19	4	Hand cart	✓	✓	✓	Yes
			Tailors	-	-	-	Yes
			Mixed group	✓	✓	✓	Yes
			Micro-finance	✓	✓	-	Yes
Timbwani	16	1	Micro-finance (women)	✓	✓	✓	Yes
Tudor	16	4	Sand harvesters	✓	✓	✓	Yes
			Fishermen	✓	✓	✓	Yes
			Women group (small businesses)	✓	✓	✓	Yes
			Women group (micro-finance)	✓	✓	✓	Yes
Timbwani & Bofu	4	1	Motorbike	✓	✓	✓	Yes
Total	**72**	**16**		**15**	**15**	**14**	**16**
As % of total		22		21	21	19	100
As %: focus groups with business asset adaption matrix				94	94	88	

NB: From the information in Table 3, there are more business asset-based adaptation efforts done before and during the occurrence of a weather event than after the event has taken place. It is also evident that some form of action to adapt the assets is done at every stage of the weather event.

Source: 72 focus group listing.

Table 4.4: Composite matrix of the most important collective assets and their ranking in the four study sites of Mombasa

Type of Assets	Ranking	Totals	Per cent
Health /Hospital	III III III II I II II II III III I	25	18
Houses/toilets	I III III III II III III III III III III III III II	38	27
Children	II I	3	2
Cloths	II	2	1
Livestock	I III	4	3
Utensils	II I	3	2
Teachers/pupils	III	3	2
Wells/boreholes/Water	I III II II III II	13	9
School /Education/Stationary	II III II III I III III II I III I	24	17

Consumer goods	II	2	1
Road	I III I	5	4
Church/mosque	I III I II	7	5
Land (vegetation)	I	1	1
Furniture	III	3	2
Parents	I	1	1
Crutches & members of the disabled group	III I	4	3
Tricycle	II	2	1
Total		**140**	

NB: The house/toilets are identified as the first most important collective assets. Health/hospital is the second and the third most important collective assets is school/education and stationary.

Source: 32 focus group listing and ranking

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