

# **Integrating Climate Change Considerations in Planning**

## **for Urban Development in Sierra Leone:**

### **The Case of Freetown**

A Thesis submitted for the Degree of  
**Doctor of Philosophy**

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## **Abstract**

Much of the climate change literature is replete with discussions about the potential impact of climate change on cities. Whilst urban planners are increasingly being urged to develop robust and clear strategies for dealing with the impacts, in reality there is very little knowledge about the way the local context shapes whether, and how, planners and households are able to address the challenges posed. Moreover, since much of the literature on the response to climate change impacts has focused mainly on national level actions, there is very little knowledge about how such actions should be carried out in particular cities. Although local levels are now increasingly being recognised as plausible action points, the way in which institutional structures work to either shape vulnerability, or to constrain households and urban planning responses, has been largely ignored and the links poorly theorised.

This study questions the dominant assumptions about ‘institutional fit’ and argues that the ingenuity of human agency in dealing with climate change can be constrained by the planning structures within which actions take place. The study uses Sierra Leone’s capital – Freetown – to explore this argument by examining the linkages between the country’s urban planning system, the structures of governance, and the system for climate change response and adaptation management. Using a multi-disciplinary approach that has been developed on both theoretical and empirical grounds, the research examines the important challenges that must be addressed in order for urban planning processes to effectively address climate change response and adaptation issues. The research uses a variety of data collection techniques (quantitative and qualitative) to investigate the constraints placed on actors at different levels in shaping the city’s development process and how this will be affected by climate change.

The thesis proposes a framework to offer insights into some of the more practical considerations and approaches behind making climate change an integral part of urban planning. However, the inclusion of climate change considerations in urban planning decisions raises questions about what kinds of adjustments ought to be made to the current planning system. The thesis concludes that whilst institutions do not guarantee what actually happens in practice, they are critical for urban planning responses since the integration of climate change concerns into policy and practice is largely dependent on national and local level institutions.

## **Dedication**

**To**

**The memory of my Dad - Joseph Mustapha Macarthy.**

**May his soul rest in perfect peace.**

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## **List of Acronyms and Abbreviation**

<b>CBO</b>	<b>Community Based Organisation</b>
<b>CCS</b>	<b>Climate Change Secretariat</b>
<b>CH<sub>4</sub></b>	<b>Methane</b>
<b>CO</b>	<b>Carbon Monoxide</b>
<b>CO<sub>2</sub></b>	<b>Carbon dioxide</b>
<b>CVI</b>	<b>Cumulative Vulnerability Index</b>
<b>DMO</b>	<b>Disaster Management Office</b>
<b>EC</b>	<b>European Commission</b>
<b>FAO</b>	<b>Food and Agriculture Organisation</b>
<b>FCC</b>	<b>Freetown City Council</b>
<b>FD</b>	<b>Forestry Division</b>
<b>GCM</b>	<b>Global Circulation Model</b>
<b>GEF</b>	<b>Global Environmental Facility</b>
<b>GHG</b>	<b>Greenhouse Gas</b>
<b>GVWC</b>	<b>Guma Valley Water Company</b>
<b>IMF</b>	<b>International Monetary Fund</b>
<b>INC</b>	<b>Initial National Communication</b>
<b>IPCC</b>	<b>Intergovernmental Panel for Climate Change</b>
<b>MAF&amp;FS</b>	<b>Ministry of Agriculture, Forestry and Food Security</b>
<b>MD</b>	<b>Meteorological Department</b>
<b>MEWR</b>	<b>Ministry of Energy and Water Resources</b>
<b>MFEP</b>	<b>Ministry of Finance and Economic Planning</b>
<b>MHS</b>	<b>Ministry of Health and Sanitation</b>
<b>MLCP&amp;E</b>	<b>Ministry of Lands, Country Planning and the Environment</b>
<b>MTA</b>	<b>Ministry of Transport and Sanitation</b>
<b>MWIHTM</b>	<b>Ministry of Works, Infrastructure, Housing and Technical Maintenance</b>
<b>NAPA</b>	<b>National Adaptation Plan of Action</b>
<b>NBSAP</b>	<b>National Biodiversity Strategy and Action Plan</b>
<b>NDP</b>	<b>National Development Plan</b>

<b>NEP</b>	<b>National Environmental Policy</b>
<b>NEAP</b>	<b>National Environmental Action Plan</b>
<b>NGO</b>	<b>Non Governmental Organisation</b>
<b>NLPLC</b>	<b>National Land Policy and Land Commission</b>
<b>NOx</b>	<b>Nitrogen oxide</b>
<b>NPA</b>	<b>National Power Authority</b>
<b>SLEPA</b>	<b>Sierra Leone Environmental Protection Act</b>
<b>SLNTC</b>	<b>Sierra Leone National Telecommunications Company</b>
<b>SLRTA</b>	<b>Sierra Leone Roads Authority</b>
<b>SNC</b>	<b>Second National Communication</b>
<b>CCTC</b>	<b>Climate Change Technical Committee</b>
<b>TCPA</b>	<b>Town and Country Planning</b>
<b>UNCBD</b>	<b>United Nations Convention on Biological Diversity</b>
<b>UNCCD</b>	<b>United Nations Convention to Combat Desertification</b>
<b>UNDP</b>	<b>United Nations Development Programme</b>
<b>UNFCCC</b>	<b>United Nations Framework Convention for Climate Change</b>
<b>WHO</b>	<b>World Health Organisation</b>

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# **Chapter One**

## **Introduction**

### **1.1 Background**

It is soon after midnight in September 2009. Marie and her four kids have just been rudely awakened by a heavy downpour of rain at Kroo Bay, one of Freetown's most deplorable slums. As usual, she quickly wakes up the kids and they hastily prepare to head off from the coast-border makeshift shack which they only recently rented. On their way up to the higher ground, as they hurriedly navigate their way from the torrents of devastating flood, the mounds of rubbish on which their dwelling stands give way to bumpy tracks. Arriving part-way up the slope and with nowhere else to relocate, Marie dreads the uncertainties now lying ahead, especially as the family were unable to save any of their belongings. Marie is one of thousands of Freetown residents living in unsafe areas that are prone to the adverse effects of climate change. Yet, in spite of their troubled conditions, Marie, like many other residents, cannot fully understand what is responsible for their current situation; all she can do is continually prepare for the worst event that may befall them.

Living with vulnerability in the context of increasing weather extremes and with inadequate adaptation measures is a difficult experience in the daily lives of the urban poor. It is about living in unstable areas with inadequate infrastructure and services, where residents are constantly faced with the challenge of whether to stay and fight an imminent hazard or leave before it occurs. It also involves thinking about what level of harm to accept, to what extent you are able to resist it, safe places to temporarily relocate, taking into consideration your family's wellbeing along with their safety. These choices also depend on the degree of responsiveness of the local urban policies and laws and the quality of the institutional environment within which decisions are made about the city. For example, is land for building and housing easily accessible? Are the planning regulations and laws very robust and effectively enforced? Are there early warning systems for weather-related events? What is the quality of information dissemination systems about weather events? In effect, while households need to make decisions to reflect their individual circumstances, the outcomes very much depend on how households and communities are organised to act, how planners and city authorities are able to deal with the challenges posed, and the extent to which governance structures are established to promote and mobilise collective action.

When households have to make decisions in contexts of uncertainty, where they have no clear idea about the best place to go and with no guarantee of recovering any assets lost, it becomes very difficult for them to decide whether or not to leave. This is because, for low income groups, a loss of abode or assets imposes a further level of vulnerability. Thus, being able to better understand the urban processes that exacerbate the situation, including the main constraints that limit the ingenuity of human action, is the first step in reducing harm resulting from climatic hazards. By developing a clear understanding of the underlying processes which work at the different levels (household, community, city, national) to intensify vulnerability in the face of climate change, it becomes easier to minimise the level of destruction that will be caused. Yet, beyond the general assessment of emission levels and the impacts which climate change will cause, very little knowledge exists about the structural forces which shape whether, how, and when households and societies respond. The structural attributes of Freetown have a bearing on the level of vulnerability experienced by Marie's family; and because such attributes also contribute to the overall level of vulnerability that exists, it is important that they are given attention in any planned response to climate change. This is particularly critical to the human settlement conditions of low income cities in the developing world where, despite rapidly deteriorating environmental conditions, the institutional base for urban planning is still very weak.

## **1.2 Conceptual and Personal Basis of the Study**

This study is about actions to deal with climate change in Sierra Leone's capital, Freetown. It is an analysis of how theoretical assumptions about the capacity to respond to climate change in a particular society (in this case, cities in low-income countries) can be constrained or shaped by the local context. My interest in undertaking this study is based in the observed increase in the number of disasters in Freetown that result from such climate-related phenomena as intense rainfall, flooding and landslides. This interest dates back to a time when I had just finished my postgraduate (MSc.) studies in urban development planning and was keen to find out why the city's urban planning and land use management systems were not adequate or robust enough to effectively reduce the devastation experienced by the urban dwellers. Yet, because previous development interventions in the city had always focused on structural responses (dams, levees), it was

possible to assume that as Sierra Leone was just emerging from a decade-long war, funding constraints may have been the core problem. Although open to question, this reasoning was more plausible at the time, given the many competing demands that were made on the government's meagre resources. The uncertainties that characterised the immediate post-war situation in the country even made it more difficult to explore this assumption. It was only in the next few years of continued reflection that I gradually became aware that such non-structural measures as planning controls, neighbourhood development, direct allocation, and the relocation of people could work to reduce the prevailing disaster risks. This knowledge coincided with a phase when I was becoming increasingly keenly interested in climate change issues, especially because of claims about the potential damage that will be caused. My reflections on how climate change will potentially exacerbate the hazard risks of poorly serviced and inadequately planned settlements provided the impetus for me to undertake this study. The purpose here is to explore the constraints that the institutional context will need to impose on individual and organisational behaviour in planning and taking actions to tackle the impacts that climate change will effect.

### **1.3 Climate Change, Cities and the Incongruity of Leading Discourses**

A number of cities throughout the globe have recently experienced severe climatic hazards of the kinds associated with climate change. Many of the emerging discourses have focused on the implications that climate change will have for human and natural systems. These discussions have been stirred up by the scale of the unprecedented changes that have been observed in global weather and climate systems. The issues have mostly focused on the way human activities are fast changing the composition and behaviour of the atmosphere and the extent of disruption which this may cause (IPCC, 2001; Cooper, 2000: 145 - 146; Tol *et al.*, 2000). Cities are singled out to play a very important role in dealing with climate change, since in addition to being the major source of greenhouse gases (GHGs), they have frequently been the major centres of impact of the most severe climatic events. Coastal cities are specifically required to take urgent action, because even if all GHG emissions were to cease today, temperature and sea levels would continue to rise globally, owing to the quantity of GHGs already released into the earth's atmospheric

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system (IPCC, 2007). Climate change impacts are predicted to be particularly adverse for many cities in the developing world, where millions of people will be severely affected in the course of this century. Urban planning is primarily called upon to play an important role in adapting cities to climate change impacts, and in mitigating GHG emissions. The role of urban planning is seen to be particularly critical in dealing with climate change, since most municipal governments making urban planning decisions also have a great deal of influence over emission sources and the range of adaptation activities that take place.

While most of the discourses in this area have either focused on examining man's impact on global climate systems or the adverse impacts which these changes will present, only a few studies have so far recognised the role which institutions play in shaping or constraining the choices open to actors. Institutions matter for the reason that the quantities of GHGs emitted from cities and the adverse impacts which climate change will present are all shaped by local institutional contexts. These same contexts shape what responses takes place and how. Thus, actions to reduce the vulnerability of Marie's family at Kroo Bay, or to integrate climate change considerations in urban planning decisions are conceived, shaped and carried out within the context of certain specific institutions in Freetown. Institutions are essential as it is hard to conceive of how weak and ineffective planning institutions that rarely allow participatory processes could work effectively to mitigate GHG emissions or reduce climate change impacts on cities. It is similarly inconceivable to expect locally-driven climate change response actions to thrive or multiply in Marie's settlement without an organised and capable institutional structure that is prepared to work to mobilise individual and collective action.

Because climate change actions do not take place in an institutional vacuum but have always relied on national and local level institutions to ensure their success, it is important to understand how institutions can be made to become more supportive of appropriate responses. Yet in Freetown, as with many other low income coastal cities, where climate change effects are likely to be severe, neither the local level climate change impacts, nor the exact roles which institutions should undertake, are clearly understood. Awareness of the need to address climate change issues in Sierra Leone's institutional structures are still new realities, despite the country's long familiarity with the concept. The country has yet to initiate a national strategy for dealing with climate change and also to establish a unified structure with clear responsibility for managing the response. To date, no specific policy exists on climate change and actions to deal with the impacts are taking place in a "context

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of transition from government to governance” (Bulkeley and Betsil, 2003). Several of the sectors affected by the impacts suffer from institutional deficiencies and fragmentation, which constrains any common-front engagement with the problems. Thus, while the ‘at risk’ population who will be disproportionately affected by climate change impacts are anxiously seeking a reduction in their vulnerability, the current approaches to climate change run the risk of failing to rise to the challenge. How can cities effectively deal with climate change concerns, particularly in the developing world, where despite many individuals’ significant actions, there are still no appropriate structures with sufficient capacity to help urban planners work with individuals and the community to minimise climate change impacts?

Institutions as North (2009) describe them are self imposed constraints (formal and informal) which shape human interactions in society. They provide a framework for the daily activities of life and can therefore determine the opportunities in a society and how organizations take advantage of them. Institutions can profoundly shape the way climate change is addressed in cities by creating enabling conditions for cooperative solutions to the problems it raises. Institutions such as planning laws can be used by society to control people’s access to and use of land, including their behaviour towards each other. Such institutions can help to enable a more harmonious link between humankind and nature in ways that will ensure better results for environmental and societal objectives. Conversely, however, institutions can act in ways that will impede the urban development aspirations of cities by combining with other societal and environmental forces to trigger climatic stresses. To the extent that there is always a fit between local or national climate change goals and the city’s urban planning objectives, institutions can be viewed as highly supportive, and responsive to climate change exigencies. However, actions to address climate change issues can be severely constrained if they are grounded in institutions that are at variance with the developmental and environmental priorities of the country. Whilst appeals for urban planning processes to take active actions to address climate change in cities are constructed based on certain assumptions about cities’ capacities, these capacities are actually rooted in institutions (Smith *et al.*, 2005; Ikeme, 2003). This is mirrored by the state of ‘fitness’ of the various planning arrangements and policies that exist. An understanding of how these structures shape and constrain actions at different levels of governance in the country will be critical in improving the competence of urban planning responses to climate change in Freetown.

## **1.4 Research Questions and Objectives**

This study examines the relationship between cities, climate change and urban planning in a developing country context, focusing on Sierra Leone's capital city, Freetown as its case study. The research aim is to raise the profile of climate change concerns within urban planning decisions and processes, and to encourage planners and city managers to consider climate change issues when making decisions about the more sustainable and organised development of cities. The study is an attempt to bring to light a question that is hardly considered in the climate change literature as it relates to cities: What institutional conditions provide the appropriate context for integrating climate change considerations in urban planning decisions and processes in the cities of the least developed countries? To provide answers to this question, the study will address itself to a number of related themes focused on the institutional constraints which shape urban planning responses to climate change. The objectives of this research will be explored by way of seeking answers to the following research questions:

- i. What are the key climate change concerns for the development of Freetown?
- ii. How does the institutional structure for climate change management support the integration of climate change issues in urban planning decisions?
- iii. Does the state of planning institutions in Sierra Leone provide the right context for integrating climate change issues?
- iv. What are the key challenges to making climate change concerns an integral part of urban planning decisions in Freetown and, how can the gaps be resolved?

The key objectives which this study seeks to address are:

- i. To provide an overview of Freetown's current climate vulnerability and the main challenges which climate change presents to the city's future development;
- ii. To investigate the climate change management process, from both institutional and governance perspectives;
- iii. To investigate the present state of urban planning and the institutional conditions that shape planning decisions for dealing with climate change in Sierra Leone;
- iv. To identify the key impediments to an integrated approach to climate change response planning and set forth a framework that provides a more organized approach to making climate change an integral part of urban planning decisions and processes.

## **1.5 Significance of the Study**

The key stimulus for this study is to contribute to existing knowledge on how urban planning can be made to effectively deal with climate change. The study seeks to produce supplementary knowledge that can accentuate the role which institutions play in the process of integrating climate change considerations in urban planning decisions and practices. It specifically questions the dominant assumptions of ‘institutional fit’ in existing discourses about planning roles in reducing climate change impacts. Most of these writings have characterized climate change only in terms of the potential changes in climate and the impacts that will result, without attending to the institutional characteristics that determine how or whether responses are, in fact, feasible. Although there is now an increasing body of literature which underlines the role of planning institutions in climate change adaptation and mitigation, only a few have so far explored the concept in an urban context. With climate change impacts threatening to reinforce the complexities imposed on cities by high population growth rates, demographic changes, poverty and varying kinds of environmental degradation problems, the role of planning in urban areas should unavoidably be the prime focus of discourses on climate change. This is particularly significant for cities in the developing world where human settlements are fast deteriorating due to inadequate planning systems and poor infrastructural development. This work attempts therefore to reposition the prevailing discourses about the role urban planning processes can play, by emphasising the importance of institutions in addressing climate change issues.

Institutions are important because the integration of climate change issues will have to rely on urban planning institutions at both the national and local levels for their success. It is thus, imperative that any discussion on the role of planning in assuaging climate change and its impacts must reflect the institutional conditions that enable or constrain the effectiveness of the response action. It is hoped therefore that this research will inform current and future thinking about climate change by challenging scholars to probe beyond the general sources of GHG emissions and claims about climate change impacts. Viewing climate change solely from this angle omits attention to the structural and technical constraints that need to be addressed in dealing with climate change. It is also hoped that by way of the proposed integration strategy, this research can inform policies and practices which underlie urban planning and climate change management.

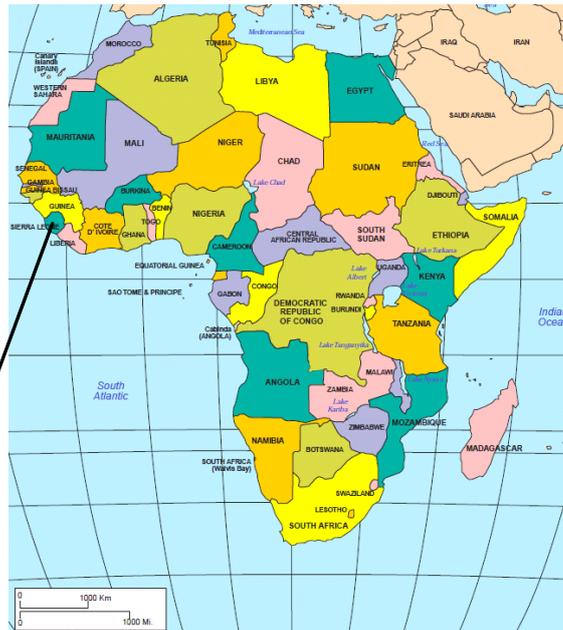
## **1.6 Research Strategy**

This study examines the role which institutions play in shaping or constraining actions to embed climate change issues in urban planning decisions in a less developed country-city (Freetown) context. While most of the research on climate change has so far focused on estimating the level of anthropogenic GHG emissions and the extent of damage which they may cause, the factors which determine whether or not (and how) individuals and societies will be affected by the change and how or why they do not respond to the challenge has not been sufficiently addressed. Action to address climate change is more complex than is usually imagined (Yohe, 2001) in most academic literature, especially that literature which urges urban planners and city authorities to take immediate actions to deal with climate change. This difficulty is principally because climate change actions involve attitudes and values which are inherent to the individual and the institutional contexts within which decisions are made. This therefore requires an approach that focuses on the social processes of Freetown in order to analyse households' perceptions, experiences and choices, in addition to the socio-ecological and institutional context which determines urban planning and climate change decision making processes.

## **1.7 Research Setting: The Location, Polity and Geography**

Freetown, Sierra Leone's capital is the focus of this study. Located on the south-west coast of Africa (see Figure 1), Freetown was established in 1787 as a British colony for the settlement of freed slaves. Unlike many other prominent cities in Africa, it was never a capital city for an indigenous population. Nonetheless, the settlement has grown over time from a colony, which was initially restricted and fortified against hostile indigenous tribal groups, to today's expanded city which has defied many of the physical impediments to its growth (Doherty, 1985). As the seat of government as well as the city with the oldest municipal government in British West Africa, Freetown is governed (though not separately) by both the Local and Central governments.

Map of Africa



Map of Sierra



**Figure 1:** The map and location of Sierra Leone in Africa

(Source: Cartographic Research Lab, University of Alabama)

Municipal rule was first introduced in 1893 with the setting up of the Freetown City Council (FCC) which had responsibility for the development of the city. However, in just three decades of operation, this council was dissolved owing to a strained relation between the two levels of government (Wyse, 1987). Even though local government activities were

later restored (in 1948), the unrestrained power and control which central government ministries continued to exert over local level matters in the country resulted in further conflicts which culminated in the dissolution of all local councils in 1972. Local councils only re-emerged in Sierra Leone with the enactment of the 2004 Local Government Act. In Freetown, this resurgence was inspired by the need to allow local people to have a voice in their own governance.

Freetown has a total land area of 357km<sup>2</sup> with a coastline of about 40km. Yet within this land space exist two distinctive topographic zones that have considerably influenced its growth and vulnerability which climate change will accentuate (see Figure 2). The first zone, which comprises both the city's coastline and its low-lying areas, has developed on raised beaches. These raised beaches which characterise much of the city's landscape, are generally very narrow, rising from the fringes of the Atlantic Ocean in the west to heights of between 140 to 160 feet eastward (Gleave, 1997: 261). The zone, which extends inland for some 5 km in certain places, is characterised by a range of depositional features that have resulted in massive erosional activities associated with the Peninsula Mountains (Gregory, 1962: 15).

The second zone is intermittently very undulating, consisting mainly of low hills and a long chain of higher ground that corresponds with the peninsula. Towards its far end, the land rises sharply leading into a long and narrow peninsula with heights of over 800 metres. The location of Freetown within these two zones, that is, between the Atlantic Ocean and the extensive Freetown Peninsular Mountain (see Figure 2), has always served as an impediment to its growth (outward expansion), since as a result of this topography, most developments have tended to concentrate in the low-lying areas.

### **1.7.1 Population growth**

One of the notable causes of the vulnerability of Freetown is the rapid population growth that is being experienced. The population of Freetown has rapidly grown from nearly 1,000 people in 1792 (Doherty, 1985), when the colony's population size was first estimated, to 772,873 in 2004 when the last population census was held. The 2004 population census showed that between 1963 and 1985 alone, Freetown's population grew by around 116%. With a current population density of approximately 2,298 per km<sup>2</sup>, Freetown is now rated among the most densely-settled cities in West Africa. Its current

population estimate of 1.26 million(City Population, 2011) far exceeds the 2004 national population census total. However, a significant proportion of this population, which consists mainly of low income groups, inhabits the many informal settlements that have sprouted along the hill slope areas, and on the shorelines of the Atlantic.



**Figure 2: Map of Freetown showing the Freetown Peninsular and the Western Area**

(Source: Sesay, E.M., 2005, presented in Munroe, P.G., 2009: 105)

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According to Gleave (1997), population growth in Freetown prior to the 19<sup>th</sup> century was very modest and was accounted for mainly by natural increase and the resettlement of slaves. Although immigrants from rural areas also accounted for this growth, its actual contribution was very minimal. The first time rural-urban migration was recognised as a problem was in 1823, when official population returns showed that between 10 and 20% of the city's population consisted of indigenous settlers (Doherty, 1985). For example, between 1787 when the colony (Freetown) was originally founded, to 1893 when it was unified with the interior, Freetown grew from an average-sized city of about 0.32 km<sup>2</sup>. to about 12.4 km<sup>2</sup>. By 1973, when the Freetown Metropolitan Area was established in response to the rapid population growth, its size had expanded to 68 km<sup>2</sup> (Gleave, 1997: 260). One main cause for this rapid population growth is the urban-biased policies that have been pursued by successive governments to promote development in Sierra Leone. According to Riddle (2005), this policy, which favoured the concentration of trade, industries, infrastructure, and social services in Freetown, as well as a few other regional towns, was first introduced by the colonial administrators. It was however, retained in full long after Sierra Leone gained independence in 1961 due to the country's long history of centralised administration. One consequence of the urban-bias strategy has been the widening of the spatial and socio-economic divide between Freetown (the capital city) and the provinces. The result of this gap is the 'pull' effect, which has continued to hold sway over migrants everywhere in the provinces, thereby entrenching its primacy.

An important indicator of the rapid urbanisation of Freetown is the creation in 1963-1974 of the 'Greater Freetown Metropolitan Area'. This area was created by merging Freetown which was already both overcrowded and overstretched, with some of the fast-growing suburban villages of the Western Rural District (Tucker, 1986: 33). Yet, while the city's population has continued to grow rapidly, not much has been done in the last three decades to improve its existing services and infrastructure. With the further population swell that was caused by the civil war between 1991 and 2002, there is already a major imbalance in Freetown between people's housing and infrastructure needs, and what is currently made available to them. Already, the overcrowded settlements that have developed outside of any planning approval system are among the most hazard-prone areas of Freetown.

### **1.7.2 The residential pattern of Freetown**

At the start of the 19<sup>th</sup> century when the Freetown settlement started to expand, the residential pattern was mainly status-based with the Europeans (British colonial masters) and the Creoles (descendants of freed slaves) ascribed much higher status than native African migrants. Therefore, whilst the former lived in good quality houses with better hygienic conditions at the city centre (the original settlement of Freetown), the latter settled mainly within the ethnic communities which had developed at the peripheries of this ‘high-status’ area (Gleave, 1997; Doherty, 1985). The proliferation of these communities in the east of the city centre, which is the main gateway from the provinces, resulted in the rapid expansion of this area in spite of its low status. However, as population growth intensified in the latter part of the 1800s, a high degree of ethnic mixing began, which worked to transform the prevalent social order, with both Creoles and native migrants residing in the same area. The high densities and soaring occupancy rates that ensued resulted in the worsening of environmental conditions in most of these areas. One consequence of the persistence of this unsanitary state of affairs in the low-lying city centre was its exertion of a strong influence pushing the colonial administrators to relocate in the higher altitudes of Hill Station, where an exclusively ‘low density, high quality’ European residential area was developed (Gleave, 1997). This relocation of the Europeans from the unsightly and unsanitary conditions in the city centre was to later set the stage for the further expansion of Freetown (Gleave, 1997). This was facilitated by the construction of a railway line which connected the city centre with Hill Station and some of the outlying mountain villages.

Because this segregation has continued to characterise Freetown’s development, long after Sierra Leone gained independence, a pattern of residence has evolved whereby the city is being ordered into a “crude east-west division”, relating to differences in the quality of housing and environmental conditions (Doherty, 1985). Hence, whereas those in the west are more affluent, with better serviced, better-quality housing and more spacious housing conditions, poor and squalid living conditions concentrate in the eastern and central parts of Freetown. Within these two areas, most settlements in the parts leading to the mountain foothills have developed chaotically, with some houses being built in very close proximity to one another. Like many other parts of Freetown, the growth of residential dwellings within these areas is impeded by the rugged topography of the Peninsula Mountains, along with the mangrove swamps and estuaries of the Atlantic Ocean. A major challenge which

this poses to housing is the escalating cost of rented dwellings, owing largely to the limited availability of vacant land. Although the ‘freehold’ is the main land tenure system practiced in the city, the system of land management has never been efficient. Therefore, in nearly all these settlements, there are large quantities of “modern-styled elegant” buildings cheek-by-jowl with slums and other forms of substandard dwellings (Sesay *et al.*, 2006; Doherty, 1985). This pattern of residential development reflects the poor state of planning institutions in Sierra Leone which, rather than steering development processes, tend instead to respond reactively to existing conditions in the city.

### **1.8 Why the Choice of Research Setting**

Freetown, as with many cities in less developed countries, is poorly planned and highly urbanised with a significant proportion of its population resident in informal and physically-unstable locations. Although a number of studies have been carried out about the city’s growth process, literature on urban planning is very scarce. Most of the literature relating to the physical development of Freetown has been concerned with the nature of housing conditions which, in general, are inadequate and deficient. Only a small number of studies have focused on analysing the city’s rapid and unregulated growth, which underlies its current vulnerability to climate change. A few other studies which have been concerned with land use planning have rarely directed attention to the way climate change issues can be introduced into planning decisions. For this reason, a study which explores the way climate change concerns can be integrated as important issues in urban planning decisions within a social setting is required to fill this gap. This study will also assist in providing knowledge that will increase understandings about the socio-economic forces that may have led to Freetown’s current vulnerability. This will require the use of a methodological approach that is appropriate for investigating what it is about the context that makes particular areas more vulnerable and possibly, less willing, to take actions to reduce their susceptibility to climate change impacts.

The choice of Freetown for this study is strategic in view of the present state of its vulnerability. The city experiences adverse climatic events owing its location and topography. Although coastal, the overwhelming character of its terrain is hilly. Therefore, most of its population and economic activities are concentrated in the unprotected areas along the coast. There, according to the IPCC (2007), sea level rise could be severe, with

devastating effects due to the current state of unpreparedness of the country's planning systems to cope with the impacts. This study is therefore well-placed to advance the role of planning in Freetown by making responses more proactive, dynamic and appropriate to new challenges. Since climate change is currently a major concern for nearly all the countries in the West African sub-region, a study of this nature that focuses on reducing vulnerability and emissions through the development of human settlements, can provide guidance and valuable lessons for other cities to learn from.

Other personal reasons for selecting Freetown are based on my individual experience of the city over two decades of living, studying and working there, in the course of which I have been able to develop my own personal impressions of the city's planning systems and the vulnerability of its settlements. The desire to explore the role planning can play in reducing the adverse effect of climate change on Freetown has therefore been the primary motivation for this research.

## **1.9 Methodological Approach**

Climate change results largely from man's negative interactions with nature (Klein *et al.*, 2005; Karl and Trenberth, 2003; Watson, 2003; IPCC, 2001). Therefore, exploring the causal processes of this impairment as well as the conditions that enable or constrain urban planning responses to the impact can be explored through a social science research approach. This involves the use of both inductive and deductive types of reasoning. The motivating interest in investigating ways to effectively integrate climate change issues into urban planning processes requires the researcher to inductively identify the different conceptions (ideas, assumptions and theories) that are related to this study. These call for the organisation of a conceptual framework which then permits the deductive exploration of the applicable links with the observed data. A case study strategy has been adopted which allows a contextual examination of Freetown's current state of vulnerability and the way urban planning and climate change processes are administered. The work draws on both qualitative and quantitative approaches because of the detailed knowledge that the study requires and this approach's potential for reducing bias (Creswell, 2009: 14; De Vaus, 2001).

The qualitative approach has entailed a range of complementary methods used to collect data from households, community groups and institutional (public and private) representatives in Freetown. These have included semi-structured interviews, focus group discussions, and direct observation. Further support for the primary data gathered in the study was provided from relevant secondary data, abstracted from a review of important documents collected from a number of institutional bodies. By contrast, the quantitative strand of the study focused only on household heads in the four embedded cases. It has drawn from a household survey (consisting of structured and unstructured questions) to describe and explain vulnerability trends and households' experiences with hazards. The joint data from the two types of source were separately analysed. Data from the qualitative sources were analysed through sifting and sorting to achieve patterns which were then used to identify themes. The patterns were systematically coordinated, based on a range of judgements, in order to develop a discussion of the findings. Data from the quantitative survey was first scrutinised to eliminate errors before being numerically coded to run the analysis. The NVivo and SPSS software programmes were used respectively to analyse data from the qualitative and quantitative sources. An assessment of the current state of vulnerability of Freetown formed an important part of this analysis. The significance was to show that in reality, Freetown, like many other low income cities of the developing world, currently faces a multitude of challenges which climate change will reinforce. But based on the widespread deficiencies within the planning system, as identified in the case of Freetown, it is unlikely that such cities will under present conditions be able to meet the challenge effectively.

### **1.10 Structure of the Thesis**

The thesis consists of nine chapters structured along fairly conventional lines (see Figure 3). The chapters are divided into three main parts to allow the reader to understand why and how the research was done and what has been achieved. Part 'A' is introductory and consists of chapters one to four. These chapters establish the research context and the theoretical and methodological issues that inform the study. Part 'B', which consists of Chapters five to seven, discusses the data collected. The chapters in this section are each focused on a detailed examination of one of the research questions, guided by the research

aim. Part 'C' (chapters eight and nine) concludes the study by presenting a discussion of the research findings and the thesis.

Chapter One, the **Introduction**, provides an overview of the general research issue and how the study came into being. The chapter additionally establishes the research context, to which all the data collected and analysed in this study relates. The research objectives and significance are also presented. In Chapter Two, **Cities and Climate Change: A review of the theoretical issues**, the theoretical suppositions of the literature are examined along two lines. The first examines the established discourses about climate change in terms of the role which human activities play in it and the threats it present to cities, and how this will be reinforced by the socio-ecological condition of places. The second examines the climate change response options (adaptation and mitigation) open to actors (including urban planners) and the different levels for action. This chapter sets the stage for a review of the actions planning can take, as discussed in Chapter Three, **Climate Change and the Challenge for Urban Planning**. This chapter explores the history, form and practices of planning in a developing country context, and the theories on the specific challenges which climate change will present to the planning process. The chapter specifically highlights the key limitations in current understandings about the role which planning institutions play in influencing climate change threats and responses. Chapter Four, **Research Design and Methodology**, presents the methodological approach used and the philosophical underpinning of the research. The chapter discusses the reasons for the choice of the methodological approach, and a description of the methods used for the collection, analysis and interpretation of data.

Chapter Five, **The Climate Change Concerns for Freetown**, marks the start of the presentation of the research findings, by exploring the first research question. It does this by using four embedded cases in Freetown to show how planning and institutional insufficiencies account for differences in the spread of vulnerability in the city. Prior to doing this, the chapter discusses how the way climate change has been problematised in Sierra Leone has shaped the scale and size of responses been carried out. The chapter demonstrates subsequently that in spite of the pervasiveness of hazard risks and vulnerability in Freetown, very little has been done to reduce their effects. The main climate change threats to Freetown are discussed, including the reasons why impacts will be differentiated among individuals and settlements. Chapter Six, **Institutional Structures for Climate Change Management**, addresses the second research question, by examining

## *Chapter 1*

the institutional elements that shape the management and governance of climate change in Sierra Leone. The chapter takes the earlier analysis (Chapter Five) a step forward by discussing how the framing of climate change has coalesced with deficiencies in the current management structure along with other practical and capacity problems, to limit actions on climate change at the local level. Chapter Seven, **The State of Planning Institutions in Sierra Leone**, addresses the third research question. It first examines the country's planning legislation, the history and framing of climate change in Sierra Leone, the future climatic changes that are predicted to occur, including the challenges which these changes present to the planning process. It then, highlight the historical and institutional issues that have created a difficult climate for incorporating environmental (and hence, climate change) policies and laws within it. The chapter explores the relationship between the inadequacy of the country's planning processes and the vulnerability of Freetown, as well as the challenges which climate change will present to the city.

Chapter Eight, **Final Discussion and the Way Forward**, discusses the important findings and lessons learned by pulling together the various strands of enquiry in the analysis chapters. The chapter relates findings with theory by demonstrating the importance of institutions for dealing with climate change. The fourth and foremost research question of this thesis is addressed in this chapter through a framework that shows how climate change concerns can be integrated into urban planning decisions and processes. Chapter Nine, **Final Conclusion**, sums up the reasons for paying attention to institutional issues when addressing climate change and, more specifically, when making planning decisions to integrate climate change issues. It concludes with a discussion of the implications of the research findings and identifies gaps suitable for exploration in future research.

# Chapter 1

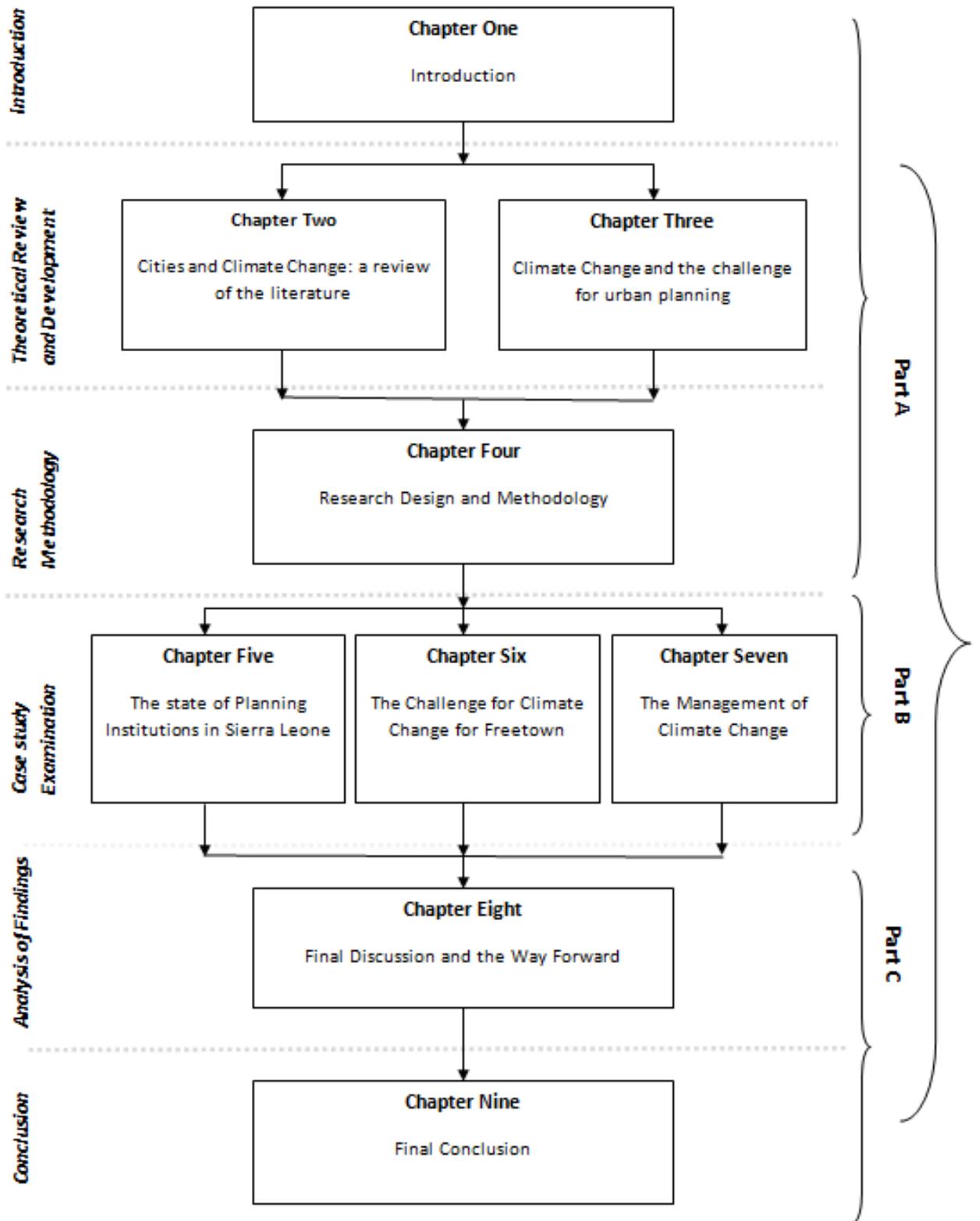


Figure 3: Structure of the Thesis

## Chapter Two

### **Cities and Climate Change: A review of the theoretical issues**

#### **2.1 Introduction**

This chapter and the next will outline a conceptual framework for integrating into urban planning practice an awareness of climate change— an issue which, despite being widely acknowledged in contemporary environment and development research, is still largely overlooked in the planning decisions of cities. The framework is situated at the theoretical interface between urban planning and climate change to reflect the interdisciplinary settings of this research. Central to this conceptualisation are the contextual and institutional forces which both drive and shape climate change impacts in cities, as well as the planning actions taken to address it. Chapter two will present the existing discourses and paradigms that underlie the current understanding of climate change and its impact claims, while Chapter three will provide a clear understanding of the wider implications for urban planning of integrating climate change issues into practice. At the end of each chapter, there will be a review of the key shortcomings of the current discourse, to reflect the conceptual position of this research within the wider debate.

#### **2.2 The Reality of Climate Change in an Urban Context**

The most unsettling aspect of climate change from the perspective of many scholars (Corfee-Morlot *et al.*, 2011; Ranger *et al.*, 2011; Romero-Lankao and Dodman, 2011; Satterthwaite *et al.*, 2009) relates to the potentially catastrophic impacts it will have on the human and socio-ecological systems of cities. Earlier empirical studies of climate change (IPCC, 2001; Tol *et al.*, 2000; Mintzer, 1992) have focused more on its causes, which have been largely attributed to human activities. These studies which were carried out more at global and national levels have provided an in-depth understanding of how the diverse activities of humankind have led to a significant concentration of GHGs in the atmosphere

with rising temperature trends observed throughout the globe. According to the IPCC<sup>1</sup> (2007), the warming of the global climate is now overwhelmingly beyond dispute (in spite of the doubts expressed by a body of climate change sceptics) and several long-term changes in the world's climate are currently witnessed in many parts of the world. The environmental impact of global warming will be manifested in the form of various types of severe weather event (Romero Lankao, 2008; Simon and Fragkias, 2008). Impacts will be reinforced more by the local contextual conditions of places (characteristics of topography and location; quality of urban planning, urban services and infrastructure) than by the average global change (Hein et al., 2008; Simon and Fragkias, 2008). Several of the recent climatic disasters involving severe disruptions to urban systems exemplify the extent to which the impacts of climate change will bear on humankind (Moser *et al.*, 2010; Bulkeley and Betsil, 2003).

### **2.2.1 Why a concern for cities?**

As the level of human understanding about anthropogenic emissions have continued to increase, later studies (Hunt and Watkiss, 2011; Satterthwaite *et al.*, 2009; Romero Lankao, 2008; De Sherbinin *et al.*, 2007) driven primarily by concerns about the potential impacts of climate change have tended to develop links between climate change and cities. These studies have shown that the areas which have experienced the greatest incidence of climatic disasters and which are still most at risk from such climatic hazards are overwhelmingly urban. Cities are at risk because many concentrate several of the production assets, highest value properties, and population densities that are most exposed to climate-related hazards (Romero-Lankao and Dodman, 2011; Romero Lankao, 2008). Although cities are generally susceptible to extreme climatic events, those sited on the coastal terrain of underdeveloped countries are arguably the most at risk. Many poor coastal cities lack the requisite protective infrastructure and resources to safeguard themselves against the impacts of climate change (Martine, 2009; Parnell et al., 2007; Reid and Satterthwaite, 2007). In its Fourth Assessment Report (Working Group II) for example, the IPCC (2007) shows that sea level rise will exacerbate coastal erosion thereby

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<sup>1</sup> The Intergovernmental Panel on Climate Change (IPCC) was set up to co-ordinate research on global climate change.

causing severe damage to the poorest coastal cities. This is because many lack the required infrastructural development to protect themselves. According to Kreimer *et al.*, (2003: 92), most of these cities emerged as port cities but the high cost of land in inner city areas and the problems of access have encouraged city development to concentrate mostly on reclaimed land along the coast. Their location in these places exposes large urban populations and a number of critical economic assets and activities to the threats of sea level rise. The predominance of the urban poor who mostly occupy marginal lands within such unstable locations where hazards abound (Corfee-Morlot *et al.*, 2011; Kreimer *et al.*, 2003) accentuates the importance for the focus on cities. Nonetheless, cities as engines of growth and sites of political decisions could also play leading roles in the search for creative and innovative responses to climate change.

### **2.2.2 Institutions and contemporary climate change discourse**

Since it has become increasingly obvious that climate change impacts will depend not so much on the actual changes in climate but so much on the inherent condition of places, recent discussions (Hardoy and Romero Lankao, 2011; Kaźmierczak and Cavan, 2011; Glaas *et al.*, 2010; Jean-Baptiste *et al.*, 2010; Hardoy and Pandiella, 2009) seem to have now focused more on the role of institutions. As described by North (2009: 3), institutions are self imposed rules which shape human interactions in society. Other uses of the term relate both to the way power is structured as symbolized by organisations, and to the socialised frames of making the world meaningful (O’Riordan and Jordan, 1999: 81). As observed by O’Riordan and Jordan, institutions determine how climate change is problematised and the measures taken to address it. Agrawal (2008: 8) has observed that local institutions are critical to tackling climate change since the various responses that have occurred have usually relied on such institutions to orchestrate them. For this reason, it is important to make sure the institutions work properly, since the way individuals and society are made vulnerable to hazard risks, and the extent to which they are able to take actions to successfully reduce their vulnerability, depends so much on how the institutions are arranged. Having a clear understanding of how the institutional processes shape and condition climate change impacts is, therefore, one of the first steps in devising appropriate responses to address climate change (Agrawal, 2008). Similar views have been voiced by Fragkias (2009) who argues that institutions provide a framework for the daily activities of

life and can therefore determine opportunities in society and how individuals and organizations take advantage of them.

While there is a dearth in the knowledge of exactly how institutions shape human responses to climate change impacts, it is possible to conjecture from existing literature how institutions condition individual and organisational behaviour, regardless of the choices they have as rational actors. Much of the literature on institutions has, however, focused primarily on their rigidity or permanence, even though this view has come under severe scrutiny as the role of actors in promoting change is increasingly being recognised (Beckert, 1999). According to Agrawal (2008: 9) how institutions impact on climate change depends on a number of different factors, among which is “the nature of severity of climate events and trends”; the level of capacity among households and the community; the state of ‘fit’ of the various social and political processes within which institutions work; and the interests that are served by those “whose decisions and actions” give purpose to the institutions. In this regard, Williamson, (1998), has distinguished two sides to looking at institutions. These are the ‘institutional environment’ which accentuates the rules to be followed; and the ‘institutions of governance’ which demonstrate how such rules are actually followed (task environment). Williamson argues that because the institutional environment provides the framework for (potential) actions, it therefore acts as the enabler or constraint to individual and organisational actions. The institutional environment (as characterised by laws, policies, values and norms) can either enable individual and organisational action (task environment) by providing incentives and rewards or constrain it through sanctions and penalties (Campbell, 2007). By giving attention to the role which institutions play in shaping climate change impacts and responses, it is possible for urban planners to evolve more appropriate actions that can increase both the mitigative and adaptive capacity of cities.

### **2.3 The Key Climate Change Concerns for Cities**

One of the two key international institutions for climate change management – the UNFCCC<sup>2</sup> – identifies the increased concentration of GHG emission in the atmosphere as a principal climate change concern. Article 2 of the same convention commits acceding

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<sup>2</sup> The United Nations Framework Convention on Climate Change is responsible for all policy issues regarding global climate change.

nations to stabilize emissions at a level that would minimize human interference with the global climate system. The second institution, the IPCC, in its Fourth Assessment Report (FAR), also identifies climate change impacts as a major global concern. Both bodies specifically warn that climate change will have severe implications for countries if urgent actions are not taken now to address it. The IPCC specifically uses a framework based on global mean temperatures to show that impacts will be unevenly spread between places owing mainly to the uneven distribution of vulnerability (Smith *et al.*, 2009). Thus, in addition to the GHG emissions and the impacts which climate change will present, vulnerability is also accentuated as a principal climate change concern.

Yet, in spite of the broad recognition of these three issues (GHG emissions, impacts and vulnerability) as the key climate change concern for cities, the majority of literature has only focused on investigating such concerns at the national level. Even for the small number of cases where concerns at the city level have been identified, there is a considerable evidence gap since many have investigated these issues as stand-alone concerns without covering the full range of effects that climate change will present. Consequently, the evidence for climate change concerns, even within one country or city, is bound to differ based on what specific concern is been prioritized.

As this study focuses generally on climate change issues, an attempt will be made in the next subsections to undertake a broad review of the relevant literature that addresses climate change concerns for cities. The three concerns earlier highlighted will be the subject of the discussion and this will be done in turns starting with the state of affair about GHG emissions in cities. It is, however, not the aim to exhaustively discuss each of these concerns here, since the key interest of this study is to demonstrate how responses to such concerns can be embedded into urban planning decisions and processes.

## **2.4 Greenhouse Gas Emissions and their Sources in Cities**

Much of the evidence on global warming affirms that the scale and intensity of GHG emissions has increased and a significant proportion of these gases are already held in the earth's atmospheric system (UN-Habitat, 2008; Bulkeley and Betsil, 2003; Satterthwaite, 1997). Cities already account for over 40% of these emissions and this amount is expected to rise as the urban population continues to increase (Hallegatte and Corfee-Morlot, 2011;

Rosenzweig *et al.*, 2011; Kennedy *et al.*, 2009). According to Strengers *et al.* (2004), the rise in GHGs is due mainly to the increased emission of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and a range of other lesser gases. Of all these gases, CO<sub>2</sub> makes up the highest quantity of emissions globally (Olivier *et al.*, 1999).

While GHG emissions in urban areas have usually been linked with the various combustion processes needed to support the functioning of cities, there is well-established literature on the increases caused by high population growth (Martine, 2009; Martínez-Zarzoso *et al.*, 2007; Shi, 2003). This view associates high emission levels with high urban population growth and argues that unless alternative actions are taken, cities risk becoming major hubs for GHG emissions. Recent analysis (Dodman, 2011; Hoornweg *et al.*, 2011; Dodman, 2009; Satterthwaite, 2009) however shows that rather than the 'size and growth' in urban populations, it is so much the consumption behaviour of particular categories of people (usually the high and middle-income groups) that influences emission levels. Satterthwaite (2009: 547) has in fact, argued that in spite of the rapid population growth observed in many low income country-cities, the urban poor who makes up a significant proportion of this population rarely have access to electricity supply. This view is shared by Wolf and Moser (2011: 548) who asserts that unlike the high income cities where per capita GHG emission by individuals and households are high, the low incomes earned by households in low income countries make their consumption levels (and hence, their emission levels) low. Other determinants of emission levels in cities have been identified to include the nature of the urban form (which influences the need for private vehicle use) and the development pathways (energy-intensive industrial development or sustainable development) followed by countries. Whilst a consensus exists that most emissions over the last century were generated by the industrially developed countries, it is envisaged that in the foreseeable future, a number of developing countries will make far higher contributions to the global total. Emissions will be high because the same development pathway which led to the high emissions in many western countries now seems to be the dominant approach adopted in many of these countries (Wolf and Moser, 2011: 548).

Several publications (Simon and Fragkias, 2008; UN-Habitat, 2008; Metz *et al.*, 2005; Kates and Wilbanks, 2003) have already identified the major GHG emission sources in cities as being transportation, building construction, industrial development, and forest cover change. Wang *et al.* (2007:2110), for instance, consider the transport sector to have

contributed between 22% to 24% of total global GHGs, most of this being sourced from petroleum consumption. The IPCC (2007) similarly estimates that while the building sector (residential, commercial and institutional buildings) currently accounts for between 30 to 40% of total global energy use, this amount will soon be exceeded as high population and economic growth rates exert more pressure for building construction.

Given the broad nature of these estimates, it is argued that the first step in mitigating GHGs is to assess the scale of emissions from cities (Dodman, 2011: 121). Yet while the UNFCCC requires all its member states to prepare and periodically update inventories regarding their total GHG emission levels, no such requirement exist for cities. Shil and Blue (n.d/n.n post 2006) have observed that the assessment of GHGs generally involve the accurate quantification of emissions through the observance of sets of rules. The work emphasises the availability of resources and skilled staff as prerequisites for any successful compilation of a GHG inventory. With regards the quantification of emissions in cities, two different approaches have been proposed by Dodman (2009) and Satterthwaite (2009). These include the production-based approach whereby the quantity of GHGs emitted from human activities is assessed only for a demarcated geographical area (for example, a city); and, the consumption-based approach in which, GHG emission is assessed for all consumed products no matter their origin. Both works argue that to the extent that cities concentrate most of the production activities, the per capita GHG emission of urban residents will be high. However, because most emission sources are usually located in the rural areas of many countries, it can be implausible to associate cities with high emission levels. Without getting too involved in an exhaustive discussion of the various emission sources from cities including the various processes involved in their quantification, the reader is referred to Wang *et al.* (2007), Bose (2000), UN Habitat (2009), Watson *et al.* (1996), Houghton (2005), Penh (2003), Moomaw (1996), Shil and Blue (n.d/n.n post 2006), Dodman (2009) and Satterthwaite (2009).

## **2.5 Climate change impact on cities**

Scholars tend (Carina and Keskitalo, 2008; Douglas *et al.*, 2008; Barnett *et al.*, 2005) to agree that climate change will potentially increase the frequency and intensity of extreme events. Its impact on cities will be more adverse because most of the developments taking place today rarely take into consideration the impacts of potential changes to the climate

(Houghton, 2004). Climate change impact is expected to vary between places and among individuals owing to their differing levels of vulnerability. The impact will therefore be potentially higher where settlements are for instance, located in low-lying coastal areas, flood plains and hill slopes (Adger *et al.*, 2003). The extent to which impacts will occur will also depend on the level of development in different places (UNFCCC, 2008: 10). Agrawal *et al.* (2008: 3) have shown that institutional and social factors are important determinants of the level of climate change impacts. They argue that the way institutions shape climate change impacts can be explained in terms of how individuals are differentially affected by the same climatic event. The work uses the examples of particular cases to explain these differences, by focusing principally on the differential access of individuals and households to resources, information, and decision-making processes. Similar sentiments have been voiced by Adger *et al.* (2003: 181) and Hardoy and Romero Lankao (2011), who have explained it in terms of the differences in the entitlement of individuals and groups to call upon collective resources.

The most important climate change impacts for cities have been identified in a number of studies (Huq *et al.*, 2007; Parry, 2007; Wilby, 2007) as sea level rise, flooding, problems of water availability and resources, human health problems, shortage of energy, and damage to city infrastructure and the ecosystem. While these may not be the only climate change impacts for cities, this review will focus only on this limited range, since they have tended to receive wider acceptance. Limiting the review to these impacts only will facilitate a better understanding of what response actions cities in developing countries ought to prioritise, given the scarcity of municipal resources.

### **2.5.1 Sea level rise**

The literature (Dasgupta *et al.*, 2009; Kaiser, 2007; Douglas *et al.*, 2000) points out that climate change will potentially cause a one metre rise in sea levels in the course of the present century. Sea level rise may lead to extensive “erosion of beaches and bluffs, increased flooding and storm damage, inundation of low-lying areas, salt intrusion into aquifers and surface waters, and higher water tables” (Douglas *et al.*, 2000: 1). Impacts will be more severe in several of the coastal cities of the developing world, where tens of millions of people will be displaced in this century alone. This will be in addition to the extensive economic and ecological damage that will occur (Dasgupta *et al.*, 2009). The

coastal cities of developing countries will be most affected, because several concentrate high populations and economic assets in low-lying areas that are less protected against the sea. As UN-Habitat (2008) asserts, the greatest potential for impact will come from exposure to such local factors as location in risk-prone and low-lying areas, poor drainage, low income, inadequate sanitation and lack of protection structures. As with many poor cities of the developing world, it is the disadvantaged and marginalized communities (often slums), having least access to shared assets and decision-making processes, that will face the greatest impacts.

### **2.5.2 Flooding**

In addition to sea level rise, climate change-induced flooding will cause the greatest menace to several coastal cities where it will potentially lead to disruptions in systems of livelihood, including the loss of lives and properties. Flooding will result mostly from heavy rainfall and changes in the built environment. Its scale, duration and effects will, however, be influenced by other factors such as topography, vegetation, soils, land use and urbanisation (Douglas *et al.*, 2008; Few, 2003:44). In some cities, flooding will be exacerbated by poor road construction systems and the obstructions caused by buildings to drainage ways (Huq *et al.*, 2007: 6). Similar views have been expressed by (Satterthwaite *et al.*, 2007) who postulate that flooding in most developing countries will be worsened by the widespread development deficit in 'poorly governed' cities. The frequency and severity of climate change-induced flooding may overwhelm the capacity of most city managers to deal with the scale of the problem.

### **2.5.3 Water availability and resources**

According to the IPCC (2007) runoff and water availability worldwide will transform differentially by 2050, with an estimated increase for regions at higher latitudes, including some areas in the wet tropics, and decreases in areas of the mid-latitude and in the dry tropics. These changes are likely to put billions of people at risk of water deprivation, especially in countries already challenged by problems of water stress. Houghton (2004) associates water stress with the high demand caused by population increase and the desire for higher living standards. He asserts that water availability and management will be substantially challenged by climate change, particularly in regions where water problems

are already critical. Some, however, are projected to occur in locations where such problems are currently rare. As these include several cities in the developing world which are constantly under pressure to obtain sufficient water for an ever-increasing population, any decrease in water availability due to climate change will be extremely problematic (Satterthwaite *et al.*, 2007; Adger *et al.*, 2003).

#### **2.5.4 Energy and the built environment**

The general literature (UN-Habitat, 2009; Gill *et al.*, 2007; Pyke and Andelman, 2007) recognises that cities will experience increased temperatures as a result of climate change. These high temperatures will potentially be aggravated by the enormous heat-energy absorption capacity of certain building materials during daytimes, meaning a slow, overnight release of heat (Wilby, 2007:33). Moreover, because many of these cities experience lower wind speeds meaning less evapo-transpiration, surface temperatures are bound to rise. Higher temperatures and humidity might increase demands on the energy supply for air-conditioning systems (Munasinghe and Swart, 2005). High energy demands in the face of climate change are likely to increase pressure on city managers, especially in cities which rely strongly for their energy supply on such climate-sensitive power supplies as hydro-electricity and biomass. Where a decrease in their availability coincides “with greater aridity as well as pressures from growing demand,” it could have far-reaching consequences on urban livelihoods, as well as “indirectly raising commercial energy demand” (Munasinghe and Swart, 2005).

#### **2.5.5 Human health**

Climate change will also impact human health in cities. Even though some of these impacts may tend to be positive (moderate seasonal conditions in hot countries), they will generally be adverse (McMichael *et al.*, 2006). This will take many forms including the prevalence of heat stress and the spread of vector-borne infectious diseases. Heat stress is predicted to rise especially in cities of the mid and high latitudes, where it is believed likely to have adverse effects on such vulnerable groups as the aged and the urban poor (McMichael *et al.*, 2006; Munasinghe and Swart, 2005). Apart from altering the seasonality of vector-borne infectious diseases, climate change will also increase their spread outside the range of the regions where they currently proliferate (Munasinghe and

Swart, 2005:223-226; Houghton, 1997:131-132). For many areas, malaria-carrying mosquitoes may become the most serious threat, as nearly half of the world's population is now thought to be at risk of this disease. As Bartlett (2008: 24) shows, its incidence as reflected in high death and morbidity rates, which have already increased by 10% in the last decade, now account for 3 million deaths per annum. Climate change will also have effects on air quality in cities with adverse effects on respiratory health (Patz *et al.*, 2005).

### **2.5.6 Impacts on ecological systems**

According to Hulme (2005: 786), the impact of climate change on city ecosystems will result largely from the combined effects of temperature and rainfall. Plants will be particularly at risk, due to changes in the rates of evaporation, especially in arid and semi arid ecosystems. Water stress resulting from acute precipitation problems may also have direct impact on species and on the spread of vegetation (McCarthy, 2001: 321). Scholze *et al.* (2006) have similarly observed that forest clearance in cities may have the potential to increase runoff. This can be a major source of flood risk, with very severe consequences for many settlements that have developed in unstable areas. Ecological impacts will also be severe for settlements which derive most of their livelihood support from coastal marine systems. This threat will be exacerbated by habitat alteration that results largely from increased coastal urbanization in addition to pollution.

## **2.6 Vulnerability and Climate Change**

The most important factor that will influence climate change impacts on cities, according to many scholars (Hardoy and Romero Lankao, 2011; Hunt and Watkiss, 2011; Rosenzweig *et al.*, 2011; Jean-Baptiste *et al.*, 2010), is vulnerability. As evidenced by recent severe climatic events, nearly every part of the globe is already vulnerable to climate change. For example, in 2010 alone, the world witnessed one of the worst ever floods in Pakistan (July to August) which directly affected over 18 million people, with close to 2,000 deaths in four regions. Within the same period, a tropical cyclone in China (May to December) destroyed (through flooding and landslide) considerable terrain in South China, causing the death of over 3,222 people with 1,003 more missing. The frequency and severity of the incidence of these events, especially in cities, highlights the

extent to which populations, infrastructures and urban economies have become vulnerable. According to Schilderman *et al.*, (2004:415-416), the concept of vulnerability emerged from the dominant approaches to natural disasters in the 1960s and 1980s which focused mainly on investigating hazards as the triggers for disasters. Over the years, it has been applied in a range of disciplines to reflect the different conceptual positions of scholars.

Within the climate change literature, vulnerability is usually presented as a two-dimensional concept comprising both the risk of harm to an individual or system (hazard and stress) and the extent to which the internal properties (the different means and capacities to reduce the impact) allow that individual or system to resist, cope with or become liable to the ensuing impacts (Romero Lankao and Qin, 2011; Moser *et al.*, 2010). For that reason, it is conjectured that any meaningful analysis of vulnerability should focus on how these two dimensions interact. Yet, in spite of this level of understanding, much of the climate change literature to date focuses more on the threats of harm (hazard and disaster risks), rather than the internal attributes (institutions, assets, exercise of power) of systems which serve to reinforce the harm.

Gasper *et al* (2011:150) has attempted to clarify the relationship between risk and vulnerability by arguing that unlike risks which create the likelihood of hazard events, vulnerability is about the specific attributes of systems which increases (or decreases) the potential of harm. Many scholars (Corfee-Morlot *et al.*, 2011; Dodman, 2011; Hardoy and Romero Lankao, 2011) tend to also agree that population density and the form and pattern in which cities develop can have a significant influence on the level of vulnerability. Hardoy and Romero-Lankao have in fact, argued that population density in cities with inadequate infrastructure and services can exacerbate hazard risk. A counter-version by Satterthwaite *et al* (2009: 17) sees vulnerability as resulting not so much from population densities but from the huge deficiencies in the provision of urban services and infrastructure. Douglas *et al* (2008: 202) has similarly associated vulnerability with the wide-ranging changes (housing construction, forest clearance) that occur in urban areas. Whilst a lot has been said about vulnerability in the climate change literature, three major ideas that cut across all these view can be identified. The first relates to the idea that vulnerability exists, but only with reference to a specified situation and a particular hazard or a set of hazards. The second is that vulnerability not only differs widely among places but it changes over time. Thirdly, the extent to which societies are able to deal with vulnerability is determined by the state of their existing capacity (Glaas *et al.*, 2010: 527;

Fussel, 2007; Brooks, 2003). Fundamental to all these views is the suggestion that vulnerability is greatest in systems that are most at risk of stress, lack the requisite capacity to cope and respond, and are less likely to easily recover from an adverse effect (UN-Habitat, 2008; De Sherbinin *et al.*, 2007: 41).

Given the volume of existing literature on the various schools of vulnerability, it is not the intention of this work to engage in an exhaustive review of the concept (vulnerability) or of the other types (economic, ecological) of vulnerability. Rather, the focus will be on “the vulnerability of human individuals and communities to climate stress” as discussed in Kelly and Adger (2000: 325). This is based on an analysis of how the biophysical characteristics of places interact with the socio-economic processes of cities to determine the levels of vulnerability faced by individuals and their settlements. For existing reviews on how vulnerability is conceptualised in climate change literature, including discussions of other types of vulnerability, see Fussel (2007), Kasperson and Archer (2005), Brooks (2003), Kelly and Adger (2000), Kumpulainen (2006), and Briguglio *et al.* (2009).

### **2.6.1 Biophysical vulnerability**

The biophysical approach to vulnerability holds that disasters are mere abnormalities in a system, and have nothing to do with that system’s level of exposure. In particular, this reflects the ‘risk-hazard’ approach, which views vulnerability mainly in terms of the degree of exposure of a physical system to hazards and the implications this has for people and structures. Carina and Keskitalo highlight this view in their definition of this particular type of vulnerability as follows:

*Biophysical vulnerability is concerned with the ultimate impacts of a hazard event, and is often viewed in terms of the amount of damage experienced by a system as a result of an encounter with a hazard.* (2008: 15).

Studies that focus on biophysical vulnerability gives more attention to the interactions between hazard (weather-related) exposure, the sensitivity of systems and the impact that will occur (Romero Lankao and Qin, 2011: 143). Its focus, therefore, is on how climate change will be physically manifested. As such, the most vulnerable people are “those living in exposed areas where sea-level rise, increased storminess, drier conditions or heavier flooding are predicted” (Lövbrand, 2004: 28). Because it portrays vulnerability mainly as a physical event which “places people at risk” its focus is to identify “vulnerable

places” (Fussel, 2007; Dolan and Walker, 2003). However, the strong emphasis it places on physical hazards makes the approach very difficult to apply in social systems, where vulnerability is largely associated with human behaviour (Fussel, 2007: 160). For this reason, it has been necessary to investigate the social dimensions of vulnerability.

### **2.6.2 Social vulnerability**

Social vulnerability as discussed in this study relates to that put forward by Blaikie *et al.* (1994) but popularised in climate change literature by Kelly and Adger (2000: 326-330). This approach to vulnerability accentuates the ‘social’ dimension previously disregarded in climate change research:

*Vulnerability is [...] the ability or inability of individuals and social groupings to respond to, in the sense of cope with, recover from or adapt to, any external stress placed on their livelihoods and well-being.” (Kelly and Adger, 2000:326-328).*

Kelly and Adger use the word ‘social’ to underscore the human dimension and argue that any meaningful examination of vulnerability must consider how the social, economic and institutional conditions of society put people at risk of a range of climate change hazards. According to this view, vulnerability arises not only from the physical characteristics of a climatic event but to a great extent from the inherent properties of society, as determined by such factors “as poverty, inequality, gender patterns, access to health care and housing” (Carina and Keskitalo, 2008; Lövbrand, 2004: 28; Brooks, 2003). Thus, unlike the biophysical approach which focuses on impact assessment, social vulnerability reviews are mainly bottom-up, with a central focus on “current vulnerabilities, rather than future impact” (Lövbrand, 2004: 28). According to Fussel (2007:160), social vulnerability reflects the ‘political economy approach’ which focuses largely on people, with its central question being: “who is most vulnerable, and why?”. This perspective holds that people are unequally exposed to climate change because of the uneven distribution of risks. It therefore argues that understanding the socio-economic and political context of the systems within which the impacts occur may well determine the degree of vulnerability that exists (Kelly and Adger, 2000:329). Romero-Lankao and Dodman (2011:116) have similarly underlined that vulnerability studies which focus on the inherent condition of systems help to explain how differences in assets and the capacity to respond, coalesce with the policy and governance framework to shape the way vulnerability is distributed.

## Chapter 2

According to Kazmierczak and Cavan (2011:187), it is these same processes that account for the differences in individual and household's access to information as well as the ability to prepare, respond to, or recover from weather-related events.

Hardoy and Pandiella (2009:203-204) have sketched a broader picture of the inherent properties that cause the vulnerability of systems to extreme weather events. These relate to the disregard for risk reduction prior to hazard events since most people tend to consider disasters as "natural" events; the lack of a clear understanding of the size of the potential impact, and; the failure of governments (local and national) to consider climate change risk and vulnerability in urban planning and development. This view has been supported by Satterthwaite (2009:15-17) who identify three main factors that create vulnerability in urban centres. These include the processes that lead to urbanisation and urban change; the inadequate capacities of governments, and; the location and expansion of settlements in areas that are hazard-prone. He suggests that to better understand why most cities have a significant proportion of their populations at risk from climate change, it is important to have a clear understanding about what makes people concentrate in at risk areas and which urban processes may exacerbate such risks. Many scholars (Romero Lankao and Qin, 2011; Rosenzweig *et al.*, 2011; Moser *et al.*, 2010) agree that the urban poor are most at risk from extreme events because in addition to living in unsafe areas, their houses are usually built of poor quality materials with much of the construction work not following any safety standard. These buildings which are often mostly overcrowded with the spaces used both for living and working, rarely undergo maintenance. As the environmental condition is also poor considering that houses are usually built abruptly without regard to plan, drainage systems are also poor (Hardoy and Pandiella, 2009: 203). According to Satterthwaite *et al* (2009:7), it is these deficiencies that will reinforce climate change impacts in most of the low income country-cities that are poorly managed. Other factors relate to the rise in unplanned development, inadequate access to land by the poor, and the lack of access to decision-making processes. Because it is these factors that underlie the vulnerability of individuals and places, it makes more sense to not only understand them but to consider them when making decisions about adaptation responses.

### 2.6.3 Vulnerability assessment

Assessing the vulnerability of systems is the first step towards making successful planning responses to climate change impacts in cities. It is at the forefront of attempts at finding out which specific people or areas are most at risk from climate change and the reasons for their susceptibility (Kelly and Adger, 2000). It is also important for providing guidance on the specific actions to be taken in order to address the associated impacts (Kaiser, 2007). According to Næss *et al.* (2006), there is no single right assessment approach to vulnerability assessment. Thus, numerous approaches exist for assessing the vulnerability of cities to the variety of impacts associated with climate change. These range from the use of indexes derived from specially selected indicators, to the use of statistically-modelled scenarios that present information about future changes in climate. Whereas indexes rely primarily on the use of locally generated data to assess vulnerabilities, scenarios are modelled based on historical data about a country's climate (Naess *et al.*, 2006). The lack of accurate climate data at both the local and national levels in most developing countries, however, makes the modelling of scenarios very problematic. Most studies have therefore had to rely on the use of indexes to provide estimated measures of how vulnerable an area is.

### 2.6.4 Indicator definition and functions

The climate change literature is replete with discussion on the importance of indicators in measuring the vulnerability of systems. As defined by Moldan and Dahl (2007:1) indicators are “symbolic representations designed to communicate a property or trend in a complex system or entity”. Indicators have traditionally been presented as quantitative measures (for example, ratios) but qualitative variables (proxies) are now more widely used. This is predominantly in cases where quantitative data (in the form of databases) is either absent or when the phenomenon that is observed does not easily lend itself to measurement (Gallopín, 1997). With regards to climate change, Adger *et al* (2004:15) identifies three main purposes served by vulnerability indicators - to make comparison between places; provide a broad estimate of the size of the future threat, and; to increase understandings about what causes vulnerability and how these can be addressed. They show that while most studies have limited themselves to only one of these concerns, they tend to overlap in a number of works. Nardo *et al* (2005) contends that composite indicators are very useful for communicating complex realities. Composite indicators are

“formed when individual indicators are compiled into a single index” based on the use of some” mathematical or computational model” (Nardo *et al.*, 2005:8).

Hahn *et al.* (2009) observes that the use of indicators as proxies in the development of composite indexes is an important practice in vulnerability assessments. They identify the primary household survey as an important tool for collecting the required data. Primary household surveys can help to reduce the uncertainties and inconsistencies associated with climate models by enabling an easier examination of the actual vulnerabilities that exist. Nkem *et al.* (2007) identify exposure, sensitivity and adaptive capacity as the key dimensional components in assessing the vulnerability of a system. Hahn *et al.* (2009) similarly recognises household’s Socio-demographic characteristics as a major vulnerability component. Some of these characteristics which have been extensively discussed in Galobardes *et al.* (2006) include education, occupation, and income. As vulnerability is a complex reality, each of these components will need to be assigned a distinct set of indicators in order to assess the actual contributions they make to the overall vulnerability of the city. Moreover, because stresses result from multiple sources it is important to assess vulnerability within the wider socio-cultural context of cities. This is to provide understandings about the particular processes that cause vulnerability (Hahn *et al.*, 2009:74-75). Pearce (2000: 169) has emphasised the importance for vulnerability assessments to specify the particular factors that lead to vulnerability. This is important as it provides an understanding of why certain areas in particular are more vulnerable to certain kinds of hazards than others. Næss *et al.* (2006: 222) have also proposed the need to assess vulnerability at the local level since “vulnerability is location-specific” and much of the decisions to deal with its effects takes place at the local level. This view is shared by Turvey (2007:246) who asserts the need for place-based vulnerability assessments, to provide understandings about the differences in the vulnerability between settlements.

### **2.6.5 Indicator Development and Quality Criteria**

Two main approaches to indicator development are identified by Adger *et al.* (2004:17-18). These include the deductive and inductive approaches. Whereas the deductive approach is more theory-based often, involving the use of conceptual frameworks as the basis for developing indicators, inductive approaches use statistical procedures with statistical significance as the starting point. With regards to climate change, even as there is yet no

single universally accepted approach for selecting vulnerability indicators (owing largely to its complexity), a significant discussion exists on the different stages in indicator development. These phases have been discussed extensively in a number of studies (Birkmann, 2006; Nardo *et al.*, 2005; Freudenberg, 2003), so only relevant details are presented here:

- Conceptual Framework - Identify and clearly discuss the relation between the various concepts that relates directly to the phenomenon being assessed. It additionally provides the basis for making decisions on what should be measured and which specific indicator to select.
- Selection Criteria – relates to the criteria used that assures the quality of the indicator selection process
- List Potential Indicators – identification of a set of indicators used in related works and making decisions on the efficacy to adopt them using the ‘selection criteria’ as the basis.
- Normalisation – involves reducing all data sets that were measured using different units of measure, into a set of relations that reduces potentials for redundancy while at the same time, enhancing data reliability. Different normalisation procedures exist (ranking, re-scaling) but standardisation whereby indicators are transformed into a common scale with a minimum of zero and a maximum of one has been the more commonly used approach in assessing vulnerability to climate change.
- Weighting and aggregation – weighting expresses what contribution each indicator has made to the overall composite. Whilst weighting can be measured using different procedures (factor analysis, conjoint analysis etc.), equal weighting whereby the same weight is assigned to all the variables is more frequently used when measuring composite indicators. Aggregation on the other hand is the grouping of the different categories of weights into an ordered sum total.

- Visualisation - relates to the way the final information is communicated to decision makers and the public. Information needs to be clearly communicated “without obscuring individual data points” (Nardo *et al.*, 2005:28).

**Table 1: Criteria based on nature and quality of raw data**

<b><i>Relevance</i></b>
An assessment of the extent to which the data address the issues that the indicator sets out to measure.
<b><i>Accuracy</i></b>
Defines how correctly an indicator measure or describe the attributes of a research phenomenon. It moreover addresses questions relating to data reliability.
<b><i>Timeliness</i></b>
Reflects the degree to which data will remain valid and correct from the time it is collected unto the time it is transformed into an indicator to represent a phenomenon of interest
<b><i>Accessibility</i></b>
Describes the ease with which data can be located and accessed from original sources
<b><i>Interpretability</i></b>
Refers to how readily users are able to understand and make appropriate use of the data
<b><i>Coherence</i></b>
Relates to the level of association between the various data categories including the way consistency has been established between them

Moreover, while numerous quality criteria exist within the literature on indicator development, this review will limit itself only to those criteria discussed in Nardo *et al* (2005). These have been differentiated in the work into two categories - those which arise from the nature and quality of the raw data used, and those associated with the quality of procedure used to develop the indicator. With regards to the former, six main criteria are presented in this review as shown in Table 1.

Quality criteria concerning the procedure for indicator development (the latter) however, relate to all the quality measures taken at the different phases (e.g. theoretical framework,

data selection) of indicator building as earlier discussed. Because indicator development involves reducing a complex reality to a certain variable (or set of variables), there is the risk that it may not accurately represent the system they describe. Moreover, some vulnerability attributes which relate mainly to institutional issues are difficult to estimate in spite of their importance (Birkmann, 2006: 57). These challenges aside, indicators are vital for simplifying the vulnerability of a system to levels that we can understand for purposes of making comparison between places and for providing information to decision makers (including planners) to enable them take appropriate responses.

## **2.7 Response options to climate change concerns in cities**

The UNFCCC identifies mitigation and adaptation as the two key policy responses to address climate change. Mitigation is broadly used to include all actions taken to reduce GHG emissions, along with the enhancement of sink (Füssel and Klein, 2006: 303; Klein *et al.*, 2003: 3; IPCC, 2001). Critical to mitigation is the recognition that, for countries to slow down the rate of change of the global climate system, and hence, reduce the adverse impacts of climate change, there is a need to reduce the emission of GHGs. On the other hand, adaptation is used by Brooks (2003:8-10) to imply changes in both the behaviour and characteristics of a system to enable it deal with external stresses. Adaptation actions are necessitated by concerns that given the unprecedented rate of change in the global climate, the impact of climate change would be severe if current vulnerabilities were not reduced. Adaptation thus allows systems to cope with risks by reducing its current or future vulnerability to an adverse impact. While climate change policies originally focused primarily on mitigation owing largely to the initial limited understanding of adaptation issues, and of the link between vulnerability and disasters, this has now changed considerably, with both the approaches being used to promote the tenets of sustainable development (Klein *et al.* (2003).

In what follows, the specific concerns addressed by each of these approaches will be discussed in order to provide an understanding of both the nature of activities involved (in each approach) and the scale for implementation of actions. This will be followed by a discussion of the key theoretical shortcomings of the review.

## 2.8 Mitigating greenhouse gas emissions

Research indicates that cities provide plausible sites for reducing GHG emissions since they are usually centres of innovation and for major political decision-making processes (Hunt and Watkiss, 2011; Romero-Lankao and Dodman, 2011; Kennedy *et al.*, 2009). Cities can reduce GHG emissions by adopting strategies which both address energy efficiency and economic growth as well as improve (well-planned and managed) the urban form. Other mitigation strategies include actions which focus on such other concerns as social equity and waste reduction (UN-Habitat, 2009:116). According to Satterthwaite *et al.* (2009: 3), awareness about the need to mitigate emissions in cities is now well advanced in many countries. However, much of the approaches used have focused more on locating and quantifying the emission sources rather than dealing with the underlying factors (place of location, urban form, type of economic activities been carried out) which gives cause to the emissions (Dodman, 2011:122-123). Moreover, even for countries where emissions levels are regularly measured, not many have focused on determine the actual emissions that occur from cities.

Dodman (2011:121) has attributed this shortcoming to the limited powers that municipal governments have over the control of the city's emission sources, and in the setting up of emissions target. This (shortcoming) has been possible because for many countries, responsibility for climate change tends to concentrate at the national levels. Cities are therefore required to comply with national climate change policy frameworks which in many cases do not provide local authorities with the required incentives to take action (Corfee-Morlot *et al.*, 2011:171). With regards to this, Wolf and Moser (2011:551) have revealed that in contexts where climate change issues are addressed using top-down approaches, only influential groups will be considered when making decisions about mitigation responses. Other limitations to mitigation responses in many low-income country cities relates to their limited financial resources, weak institutional frameworks, and the scarcity of skilled and trained climate change professionals (Hallegatte and Corfee-Morlot, 2011; Kithiia, 2010). While cities and humans differ in terms of the scale of their total and per capita emissions, a significant discussion exist about the need to involve both city authorities and the local residents in mitigation-related decisions. This is because it is these same bodies that will have to carry out the needed (mitigation) responses (Hunt and Watkiss, 2011; Wolf and Moser, 2011; Dhakal, 2010) in spite of the active role played by international donors in many low and middle-income countries(Dhakal, 2010:280).

Golob and Hensher (1998) observes however that even as governments and individuals may want to see GHG emissions reduced in cities, not many are prepared to modify their particular lifestyles. O’Riordan and John (1996: 71) assert in a related study that it is very difficult to limit CO<sub>2</sub> emission in most countries because such restrictions are severely constrained by such other widely held societal values as the freedom and right to mobility. They surmise on this basis that because institutions support particular behaviours that favour the emission of GHGs, any reordering of institutions to limit emissions “will have to evolve from within an alert and accommodating society”. Golob and Hensher (1998) have underlined this point in their work by drawing attention to the need for city authorities to reinforce attitudes that support emissions reduction. Davidson (n.d/n.n) has extended this discussion by arguing that while most countries are willing to mitigate GHG emissions, the choice as to which specific actions to take presents a major problem for most policy makers. This is because several of the sources from which emission takes place are strongly linked to activities that support human livelihoods. Davidson notes, however, that because not all activities which lead to emissions are essential to human well-being (since some leads to affluence and over-consumption), assessments would be needed to determine which specific strategies are both more appropriate for mitigation and also promote the sustainable and equitable development of places.

A significant discussion (UN-Habitat, 2009; Marland et al., 2003; Penh, 2003; Bose, 2000; Moomaw, 1996) exist also on a variety of sectoral (transportation, buildings, industry, land cover change) approaches for mitigating GHG emissions from cities. Whilst these measures are not the primary focus of this review since many have tended to focus predominantly on emissions at the national level, much of the discussions have however, emphasised the importance of technological change. The assumption here is that countries with greater technological sophistication are better able to mitigate GHG emissions than those with less advanced technological development. This view, which provides little role for the knowledge and experiences of the local residents in decision-making processes, reflects the dominant tradition in climate change science, which has usually understood and approached climate change issues from a purely engineering standpoint. However, current conceptions of climate change are increasingly emphasising non-engineering techniques, based mostly on decision making, public engagement, the strengthening of legislation, and research (Wolf and Moser, 2011; Lau, 2005; Marland *et al.*, 2003).

### **2.8.5 Mitigation and the importance of the GHG emissions inventory**

As emphasised by Davidson (n.d/n.n), the significance of maintaining high-quality data on GHG emissions is important in increasing human understanding about man's contribution to global warming. According to Dodman, (2009:188), commitments to the UNFCCC necessitate the maintenance by all member nations of inventories on both their GHG emissions as well as their emissions removal status. Inventories based on international standards allow the monitoring of country compliance with the Kyoto protocol by reducing anthropogenic emissions. The exact emissions are, however, difficult to measure because some emission sources are not readily amenable to direct and continuous measurement (Rypdal and Winiwarter, 2001:108; Winiwarter and Rypdal, 2001:107). Measuring emissions is also fraught with several other difficulties, including deciding on the appropriate models to use for measuring particular emissions, as well as the lack of recognition of the importance of certain sources of emissions. Inventories are therefore usually based on estimates, which imply that the precise emission totals will always remain uncertain.

### **2.8.6 Mitigative Capacity**

The significance of capacity to reduce GHG emissions was first highlighted in Yohe's seminal work on mitigative capacity. His viewpoint was later reflected in the TAR of the IPCC and the work of Winkler *et al.*, (2007). Yohe's (2001:256-257) idea of mitigative capacity emerged from his observation that given the diverse nature of mitigation activities carried out across different scales and times, it is unfeasible to aggregate the mitigation potential of countries and across time periods. Rather, Yohe proposes the concept of mitigative capacity as a more effective means of providing knowledge about the ability of individuals, communities or nations to reduce GHG emissions. Winkler *et al.* (2007:692-694) has similarly defined the concept, but with a limited focus on the ability of countries "to reduce anthropogenic greenhouse gas emissions or enhance natural sinks". Both approaches view 'ability' in terms of the 'skills', 'competencies', 'fitness', and 'proficiency' demonstrated by countries or actors in reducing GHG emissions. This ability to act is regarded by the authors as the key indicator of the extent to which countries can actually reduce their emissions.

According to Yohe (2001:249-255), the mitigative capacity of any country or place is determined by the viability of technological options, mitigative policy instruments, institutional organization, decision-making processes, resource availability and distribution, the abilities of decision makers and the stock of human and social capital. On the basis of this, Winkler *et al.* (2007:695-699) have argued that countries with more wealth (higher GDP per capita and absolute size of the economy) are more likely to have greater capacity to mitigate, since they are better disposed to bear the cost of mitigation.

## **2.9 Climate Change Adaptation Responses**

### **2.9.1 Adapting to Climate Change**

Adaptation consists of diverse activities undertaken by individuals and groups for personal or collective interest and by governments in the interest of the public (Hardoy and Pandiella, 2009; Srinivasan, 2006; Adger *et al.*, 2005). It involves a continuous process of building the capacity of individuals, communities and groups to cope with a range of climatic events and to translate these capacities into actions. Decisions to adapt to climate change may involve many actors, with each having specific interests and concerns, and with separate adaptive preferences. However, because adaptive choices are often made by only a few individuals or groups on behalf of society, it is possible to privilege certain sets of interests above all others (Downing *et al.*, 1997). Moreover, whereas disadvantaged groups are most at risk of climate change impacts and are therefore best served by adaptation measures, they are often ignored in adaptation decision-making processes undertaken by governments (Hardoy and Romero Lankao, 2011; Adger, 2003).

According to Brooks (2003) and Hardoy and Romero Lankao (2011), adaptation which focuses on the inherent internal properties of systems (as characterised by poverty, inadequate housing conditions, marginality, inequality and lack of entitlement), is more appropriate, since it is these properties which, together with other physical factors (e.g. topography), mediate the likelihood and severity of hazards. Adapting to climate change should therefore involve carrying out a detailed assessment of the existing risks and the effects that climate change would have on a particular place or people (Ranger *et al.*, 2011; Roberts, 2008). Kazmierczak and Cavan (2011) observes that adaptation responses are urgently required in many low-income country cities where rising population densities coalesce with other urban processes (forest clearance, poor infrastructure, location in at

risk areas) to exacerbate the impacts of climate change. However, because climate change effects will differ widely among individuals and settlements (given their differing levels of vulnerability), it is important to tailor adaptation responses to match the type of vulnerability that is being addressed (Hallegatte and Corfee-Morlot, 2011: 5). Hardoy and Romero Lankao (2011:161) have similarly proposed a pro-poor approach to adaptation responses because of the uneven distribution of vulnerability within cities. Agrawal (2008:3) also provides a number of conclusions regarding ways that institutions can enable adaptation responses at the local level. These relate to the need to support and promote partnership among the different actors (public, private and civil society) as well as improve capacity among local level organisations to enable them cope with the potential effects. Other approaches include the provision of support for vulnerable groups with the least institutional access to resources and, embedding the collective climate change concern of communities into other national policy objectives (for example, growth, poverty alleviation, equity, and sustainability) as part of the wider adaptation objectives of governments.

### **2.9.2 Why adapt to climate change and how**

According to Adger *et al.* (2005:79), adaptation is required specifically to decrease the vulnerability of systems by enhancing their capacity to cope with the changes that occur. However, the diverse nature of the environments in which adaptation takes place and the broad range of measures involved implies that there can be no single approach to adaptation. Fussel (2007) describes two of the most common categories of adaptation as autonomous adaptation and planned adaptation. He describes autonomous adaptation as that which is widely undertaken by individuals in response to a stimulus. Planned adaptation, by contrast, takes place either in anticipation of a climatic event or after the event has occurred. Planned adaptation frequently takes the form of direct policy intervention by governments, based on the belief that the said response is required either to redress an existing state or in anticipation of a stress (Füssel, 2007).

### **2.9.3 Enhancing adaptation responses: why plan adaptation?**

Many scholars (Lemos *et al.*, 2007; Adger *et al.*, 2005; Burton *et al.*, 2005) have emphasised the importance of planning adaptation activities either in response to or in

anticipation of climate stimuli. They argue that whatever the scale of implementation, planned adaptation, based on adequate and reliable information on the system, can considerably enhance the adaptation process (Srinivasan, 2006:77). Fussler (2007:270) adduces that adequate and reliable information concerning a system's future climate, as well as its current and future vulnerabilities, is significant for adaptation planning in three main ways. The first is that it substantially reduces uncertainty by creating confidence in the state of knowledge and awareness of the problem. Second, it enables adaptation options to be identified in ways that make the most efficient use of resources. Third, it motivates an easier identification of more effective ways to build synergies in the implementation of adaptation activities. Smith and Lenhart (1996:194) also argue that under conditions of highly uncertain climate, targeting planned adaptation measures to only one risk might expose the system to other kinds of risks. They argue that generating detailed information on the system as a whole could make policy measures more robust, to enable systems to respond effectively to varying kinds of risks, as well as enabling them to adapt to, and quickly recover from, changed conditions. The UNFCCC (2008:29) similarly argue that to make planned adaptation responses more effective, ministries, agencies, institutions and non-governmental organisations should integrate climate change concerns in their planning and decision making processes.

Having reviewed the adaptation theory more broadly, the next subsection will now briefly discuss the specific adaptation activities for dealing with climate change impact in cities.

#### **2.9.4 Adaptation to sea level rise**

Tol *et al.* (2006:471-473) have proposed three key options for adapting to sea level rise, which are to 'protect', 'retreat' or to 'accommodate'. The first option involves the use of both structural (dikes and sea walls) and non-structural approaches (strengthening of legislation, the use of traditional systems of flood control, Integrated Coastal Zone Management techniques) to minimise potential climate change impacts. The authors associate the second option with an outright abandonment of low-lying areas, relocating to higher ground; while the third option involves strengthening existing flood defences rather than retreat. Lau (2005:12) has also used engineering and non-engineering approaches to distinguish the two measures (structural and non-structural) used to protect settlements. Both Tol *et al.* (2006) and Lau (2005) argue that because engineering-based solutions

make huge financial demands on the country's budget, non-engineering approaches are likely to be the dominant adaptation responses in many cities in the least developed countries (Tol *et al.*, 2006:471; Lau, 2005).

### **2.9.5 Adaptation to flood**

Adaptation responses to flooding vary considerably between different places and may constitute several of the actions taken prior to, during or after the occurrence of floods. Many of these responses have either been structural or non-structural (Smith, 2004; Few, 2003:47; Parker, 1999). While the structural approach has been the most frequently used, it has been criticised because of the huge financial and maintenance costs involved, including the environmental costs associated with its construction (Few, 2003; Smith and Lenhart, 1996; Blaikie *et al.*, 1994). Contemporary conceptions of the non-structural approach entail its receptivity to city-wide flooding responses as well as responses at the household and community levels. Few (2003) identifies land use controls, early warning systems, the setting up of evacuation systems, the enforcement of building regulations, and the promotion of insurance schemes as critical requirements for effectively responding to flood. He suggests that diverse response mechanisms exist at the community and household levels and that for many settlements, strategies may differ from the prediction of flood up to the recovery phase. He adduces that local knowledge, along with the experiences of local people regarding how previous floods were managed, can be an important source of information for adapting to floods at the local level.

### **2.9.6 Adaptation to water resource changes**

In his works on water management in sub-Saharan Africa, Muller (2007) provides three compelling reasons why cities need to adapt to changes in rainfall patterns and stream flow. He asserts firstly that because it is already expensive to provide water to cities, any reduction in supply due to climate change impacts will result in large areas remaining unserved. His second argument is that because the collection and treatment of wastewater already exerts enormous strain on the budgets of many cities, any reduction of stream flow due to increased pollution may heighten climate change impacts on water resources. Muller's third argument is that any reduction in water supply may cause power failures with adverse consequences, for any cities that source their electricity from hydropower. He

therefore calls for urgent action to be taken globally to safeguard the world's cities from any future water resource problems.

Similar views have been voiced by Satterthwaite *et al.* (2007: 38) who assert that for many cities of the developing world, any meaningful adaptation response should be reviewed within the wider framework of the huge deficits that prevail in the provision and management of water. The work questions the logic of attributing water deficiency in many poor cities to water scarcity. Rather he argues that the poor foresight of city managers, their limited attempts to expand water sources, and the inadequate improvement of water provision are the obvious causes. Frederick and Major (1997: 19) also identify technology, the country's socio-economic context, and the "values which society places on alternative water uses" as important determinants of water resources adaptation. They hold that water availability and quality can be enhanced by huge investments in water infrastructure. Satterthwaite *et al.* (2007) have alternatively emphasised the need to develop local capacity in making technological choices about water provision, as well as in the building of appropriate institutional frameworks for managing it.

### **2.9.7 Adaptation to land cover change**

Gordon (1990) proposes that predictions of higher temperatures due to climate change necessitate actions to restore habitats, by promoting the greening of those parts of the city where all vestiges of nature have been swept away. He argues that rather than allow cities to continually grow in alienation from nature, city managers should adopt newer forms of planning practices that ensure the ecological restoration of lost natural resources. Gill *et al.*, (2007: 127-130) propose green infrastructure as one of the new planning practices that can invigorate adaptation responses to climate change. They view green infrastructure practices as involving the preservation and enhancement of greenspaces wherever they exist in the urban environment. The work points out that while greenspaces have moderating effects on the local temperature of cities, it is practically impossible to develop large green spaces in a number of high-density residential areas of the developing world. Adding greenspaces will therefore require a more thorough understanding about how to plant trees in residential settlements that can prevent damage to buildings (Gill *et al.*, 2007: 128). Other adaptation activities include revegetation; saving trees through the prioritisation of particular areas; and reinforcing the competencies of institutions

traditionally charged with responsibility for urban land management and protection; the setting up of migration corridors around watersheds and; the promotion of integrated management practices in natural areas (Pyke and Andelman, 2007: 244-246; Wackernagel and Rees, 1996: 198).

### **2.9.8 Adaptation at the individual/household scale**

As Smith *et al.* (2003) assert, individuals and households have a long tradition of adapting to climate-related hazards because response to the vulnerability to climate risk is part of human life. Their use at the household level signifies the existence of varying levels of competence at the local level. Mendelsohn (2000: 585-567) has also argued that because individual adaptation is motivated by self-interest, it is likely to be more efficiency-driven than is public adaptation.

Various arguments (Bichard and Kazmierczak, 2011; Moser et al., 2010; Adger et al., 2003) have also been advanced to account for the willingness and capacity of individuals to adapt. Adger *et al.* (2003: 29) have, for instance, identified access to resources as the main determinant of individual adaptation actions. While some scholars have questioned the adequacy of this reasoning, others have included access to knowledge, the huge infrastructural deficits in many low-income cities, and the poor structures of governance as the key determinant (Corfee-Morlot et al., 2011; Hardoy and Romero Lankao, 2011). A counter-argument is provided by Grothmann and Pratt (2005: 202-203) who hold that individual perceptions influence people's choices about whether or not to adapt. The work adduces that the individual's choices are strongly influenced by their perceived probabilities of exposure (to climate risk) and how severe the harm will be. Smith *et al.*, (2003: 16) contend alternatively that, in every society, the degree to which households are able to adapt to climatic hazards and risks is influenced by the enabling environment which communities provide for households to function . Accordingly, the way households are able to cope with climate change impact will vary depending on changes both in the personal circumstances of individuals/households and in the overall condition of their environment.

### **2.9.9 Community-based adaptation**

Although variously defined, the word ‘community’ is frequently used to depict “a range of overlapping social units that serve as a focus of social activity” (Allen, 2006: 84; Dynes, 1998). Its significance in adaptation activities has emerged from concerns about the inadequacies of top-down approaches that accentuate technological solutions. Van Aalst *et al.* (2008: 167) has argued that community-based adaptation in climate change management is important for two main reasons. Firstly, it involves working directly with local stakeholders who are actually at risk from a hazard. Secondly, the responses involved are usually more focused, since they are based on current climate variability and extremes. Community-based adaptation is important because it emphasises the significance of local knowledge. Its basic rationale is capacity-building at the local level through providing support for local people to become increasingly self-reliant and to take collective action against various issues and processes that work to increase the vulnerability of the people (van Aalst *et al.*, 2008; Allen, 2006). Case studies by Hardoy and Romero Lankao, (2011) have shown for example, that the provision of support for such community-based initiatives as the provision of services and infrastructure as well as improvements in housing condition are central to adapting cities to climate change. This is mainly because such activities focus specifically on enhancing the capacity and assets of the low and middle-income groups.

Swalheim and Dodman (2008) provide three key reasons why community-based adaptation is important in urban areas. The first is that such action not only allows communities to identify their own vulnerabilities and needs, but it also helps in taking actions to address such needs. The second is that such urban-based actions make adaptation processes more effective by ensuring that responses are fully adapted to the local knowledge and capacities of the people and the challenges faced by communities. Their third argument is that by providing opportunities for communities to take action in responding to their own vulnerabilities, there is the likelihood of reducing costs, as they draw support from a pool of human capital, which is anyway vital for a more successful outcome. Allen (2006: 84-86) notes that community-based adaptation can be bolstered where the capacity of residents is deliberately enhanced to enable them to take up the day-to-day management of the processes.

### **2.9.10 Adaptation at the level of local government**

Cities generally concentrate a significant proportion of the urban population most at risk from climate change. However, a greater part of the adaptation activities in many low-income countries are focused more at the national level rather than at the local level, where vulnerabilities are highest (Mukheibir and Ziervogel, 2007: 145). The general literature on adaptation (Corfee-Morlot *et al.*, 2011; Kithiia, 2010; Moser *et al.*, 2010) recognises the local level as been more appropriate to adapt to climate change since apart from being closest to the local stakeholders who should be included in decision-making processes, it enables a contextual understanding of the issues that should be taken into account when making decisions on climate change. Similar views have been voiced by Satterthwaite *et al.* (2007: 37) who identifies three reasons why city and municipal governments are well placed to address climate change risks. The first reason is that because the provision of such public goods as infrastructure and urban services is essential for reducing vulnerability in cities, municipal governments can reduce climate change impacts by making such facilities available. This argument relates to the second, which accentuates the mandate which municipal governments have in the design and enforcement of 'appropriate' regulatory frameworks for the management of land use, infrastructure, and building construction in cities. Satterthwaite *et al.* adduce, thirdly, that because city and municipal governments are empowered to manage urban growth, they therefore need to act now in order to avoid the problems that may arise from rapid growth and urbanization.

Municipal governments can also reduce climate change impacts by providing guidance on where development should take place, regulating the construction and design of buildings as well as influencing the availability of land. Other potential adaptation roles at this level include enabling communities to reduce risk; protecting low-income groups in at-risk areas; and providing suitable linkages between disaster avoidance measures and those of disaster preparedness (Satterthwaite *et al.*, 2007). Hardoy and Romero Lankao (2011:160) provide examples of a series of pro-poor activities being carried out in some Latin American cities which may work to reduce vulnerability to climate change. In Manizales (Columbia) and Ilo (Peru) for example, this involve actions which prevent "rapidly growing low-income populations" from living in hazard-prone. The integration of risk and environmental management concerns (including climate change) in Manizales's urban development plan is particularly identified as a laudable strategy. It is however doubtful how resource-weak municipal governments that are currently unable to address their

immense existing deficiencies in terms of services and infrastructure will be able to adapt cities to climate change. This is more precisely due to their low human capacities and limited understandings of climate change issues (Hardoy and Pandiella, 2009; Mukheibir and Ziervogel, 2007; Satterthwaite *et al.*, 2007).

### **2.9.11 Adaptation at national level**

While it is clear that adaptation measures are more effective at the local scale, experience shows that without the support and guidance of the national government, such interventions may not be robust enough (Burton *et al.*, 2006: 9; Apuuli *et al.*, 2000: 155). Governments have an important role to play in reducing vulnerability at the national level because many urban residents can hardly afford to reduce their own vulnerabilities (Satterthwaite *et al.*, 2007). National governments are well-placed to reduce vulnerability to climatic hazards by providing quality infrastructure for the entire city area, providing sound and robust systems for disaster-preparedness, and establishing effective systems for planning and coordinating disaster responses (Satterthwaite *et al.*, 2007; Adger *et al.*, 2003).

Smit and Pilifosova (2003: 902-903) distinguish four key roles that national governments can play in promoting the adaptation of cities. These include developing climate change policies that include consideration of poverty reduction; setting up a broad-based system for monitoring and communicating risks; creating national policies that encourage the promotion of adaptation activities; and investing in new technologies to promote the sustainable growth of the national economy. National governments can also support local governments to spread risk by diversifying income sources; establishing mechanisms for collective security; and in the identification and prioritization of local adaptation actions (Smit and Pilifosova, 2003). Adaptation at the national level can also involve the design by the central government of suitable adaptation plans that fully reflect the needs and specific concerns of people. Such plans, however, need to be supported with sound legal and institutional structures to make their implementation achievable (Ahmed *et al.*, 1999). Reid and Huq (2007) have proposed that one fundamental role that governments can play at the national level is to integrate climate change issues into national development plans and strategies. This will, however, entail building the capacity of institutions in many of the

least developed countries where the requisite systems and mechanisms to respond to climate change risks are still lacking.

### **2.9.12 Adaptation Funding**

Although funding for adaptation is well covered in both the UNFCCC and the Kyoto Protocol, actual adaptation costs are difficult to establish because the vulnerability of people and places changes over time (Bouwer and Aerts, 2006: 49). The UNFCCC, at its Sixth Conference of Parties in July 2001, established the Special Climate Change Fund (SCCF) and the Least Developed Countries Fund (LDCF). The two new funds established at this meeting were to add to the Adaptation Fund and the Clean Development Mechanism (CDM) set up earlier under the Kyoto Protocol (Reid and Huq, 2007; Bouwer and Aerts, 2006). All four funds are managed by the Global Environmental Fund (GEF). While the SCCF was designed purposely to support capacity building and technological transfer to developing countries, the LDCF was specifically designed to support adaptation activities in the Least Developed Countries (Najam *et al.*, 2003).

All the established funds were to derive their finances from voluntary contributions by developed countries. Other forms of assistance in the form of capacity building and technology transfer constituted the main action points adopted at the Ninth Conference of Parties in Milan, Italy. Najam *et al.* (2003: 225) have critiqued the adaptation funding arrangement under the GEF by arguing that because contributions to the funds are voluntary, and since the funds will have to be managed by the GEF (which had lost the support of developing countries owing to its strong leanings towards the West), not many benefits will accrue to poorer countries. Similar views have been shared by Swalheim and Dodman (2008) who observed that urban centres which concentrate most of the at-risk population are rarely considered for adaptation funding. They accuse both the UNFCCC and Official Development Assistance (ODA) of being far less inclined to prioritise urban adaptation actions.

### **2.9.13 Adaptive Capacity**

Adaptive capacity has been defined by Brooks (2003: 8) as “the ability[...]of a system to modify[...] its characteristics [...] so as to cope better with existing or anticipated external

stresses”. It is similarly viewed by the IPCC (McCarthy, 2001: 6) as the ability of a system “to adjust to”, “take advantage of opportunities” from, or “cope with” the effects of climate change and variability. Both works view adaptive capacity as being determined by the composite of a country’s social, economic, technological, biophysical, and political context. They argue that adaptive capacity has a major influence on the vulnerability of systems and that this influence is mediated through the interactions of social and environmental forces in relation to how hazards evolve. The IPCC suggests for instance that a system with a strong adaptive capacity is less likely to be at risk from climate change. It associates adaptive capacity with “economic wealth, technology, information and skills, infrastructure, institutions, and equity”, as attributes which make countries differ in their capabilities to deal with climate change impacts and risk. The work relates poverty to vulnerability and identifies the lack of access to resources, technology and data regarding weather conditions as major constraints on a society’s adaptive capacity.

Brooks (2003: 9-10) reveals however that adaptive capacities exist merely as potentials and that their value can rarely be immediately utilised since they have been built up over time. The author postulates that a strong adaptive capacity is a necessary condition for addressing climate variability and change. Smit and Wandel (2006: 286-287) associate adaptive capacity “with such other concepts as adaptability, coping ability, management capacity [...] and resilience” since it is these same forces that influence a system’s ability to adapt. The authors posit that while broader socio-economic and political considerations influence adaptive capacity more generally, local organization in terms of strong social capital and kinship networks can facilitate collective action to absorb stress.

#### **2.9.14 Development and climate change**

There is a popular consensus among scholars that development and climate change have a profound mutual influence. Munasinghe (2000: 25) had, for instance, adduced that most of the differences between countries in terms of their relative contributions to GHG emissions are due to their different levels of development. The idea suggests that much of the warming of the globe has been caused by developed countries, owing to both their lifestyles and their incessant desire for economic growth. Burton *et al.* (2006: 3) similarly associate adaptive capacity with development and argue that the extent to which countries are able to effectively deal with risks and hence, reduce their varying exposures is due to

their differing levels of development. This link between development and climate change has been justified on the grounds that while climate-related hazards have increased globally over the years, losses as a percentage of national income have largely been far higher in the less developed countries, where poverty is more prevalent.

Climate change already threatens development processes in many of the least developed countries, where severe climatic events are already being experienced. Sathaye *et al.* (2007: 695) considers that the relationship between development and climate change is particularly crucial for the developing world, where low levels of infrastructural development and rising hazard and disaster trends are likely to put massive populations at risk from climate change. Lemos *et al.* (2007: 1-2) draw from this to emphasize the need for forging a link between climate change adaptation and development, since the development community already has a valuable knowledge base from past experiences in dealing with hazards and their stressors.

## **2.10 Shortcomings of theory and conceptual positioning**

The review highlights three main climate change concerns for the planning of cities. However, because analysis of climate change have usually focused on only one or two concerns without exploring the full range of effects, it may be difficult for planners and other policy makers to acquire an adequate knowledge of the implications of climate change for cities. This may create difficulties in developing an organised approach to climate change, through city-wide strategies and measures that address the full range of effects that climate change will present. This shortcoming is the logical concomitant of a division that had long existed between the two main policy approaches (mitigation and adaptation) to address climate change. Klein *et al.* (2003:580) have advanced three major reasons for this divide. These relate to: (i) the fear that by focusing on adaptation issues, countries might tend to ignore their responsibilities to mitigate; (ii) the initial limited understandings about adaptation roles, and; (iii) the assumption that even without any specific adaptation policy, it is possible for market forces to address such concerns. Recent discussions, however, tend to agree on the relevance of integrating the two policy approaches. This suggests the need to undertake studies that addresses the full range of concerns (GHG emissions, climate change vulnerability, and impacts) for cities. This study was therefore designed with the intention of filling this knowledge gap.

## Chapter 2

Furthermore, as confidence about climate change impacts continues to increase (IPCC, 2007), city authorities are increasingly urged to take immediate actions to address climate change. This assumes that the various actors who will be required to take these actions in cities are not only knowledgeable about climate change but have already acquired the skills and resources to do so. Scholars (Gasper *et al.*, 2011; Dhakal, 2010; De Sherbinin *et al.*, 2007) have tended to hold certain assumptions about the capacity for climate change, which they maintained would represent the reality of all the countries and cities they address. This study considers that despite the wide-ranging effects which climate change will have on the globe, different countries and cities face distinct challenges, and this reality should be reflected in most of the conclusions and recommendations made about climate change.

The final shortcoming relates to the excessive emphasis placed on technical solutions (more especially, mitigation measures) in addressing climate change. By accentuating technical solutions, there is a tendency to ignore local knowledge and experiences about the context, which are a valuable source of information for decision-making processes. Nyong *et al.* (2007:788) have emphasised this point in their work in Africa by contending that while the local populations have for decades used their indigenous knowledge (about the weather and climate) to cope with drought, such knowledge has rarely been considered for climate change responses. According to Beierle and Konisky (2001:520) local knowledge is sometimes ignored because it is seen by some decision makers as having the tendency to undervalue the rigour of scientific knowledge. Nevertheless, recent studies now emphasise the value of local knowledge in addressing climate change since it improves scientific understanding and the resultant decision-making process. This study therefore, underlines the significance of local community knowledge in analysing climate change impact for cities.

## **Chapter Three**

### **Climate Change and the Challenge for Urban Planning**

#### **3.1 Introduction**

As the second of the literature review chapters, this chapter continues with the discussion commenced in Chapter two by looking more closely at the discourses on urban planning as they relate to climate change. The theoretical issues are also examined, prior to developing a conceptual framework that informs the research process.

#### **3.2 The Nature and Scope of Urban Planning**

Urban planning can be viewed in diverse ways, involving perceptions which focus on urban planning policy issues along with others which consider it in terms of planning practice. It is also viewed as involving a range of activities deliberately designed to promote the development of the built environment (Chapin and Kaiser, 1979: 4-5). Friedmann (1987, cited in Slocombe, 1993: 290) has viewed planning practice as the “collection and analysis of information to serve the public interest through guiding a wide range of human, economic and other development activities”. Much of urban planning practice has focused on managing the relationship between people and places within urban settlements. Its focus on policy issues has revolved mostly around concerns about the physical development of places and on the planning and development of cities (Birch and Silver, 2009). Since planning began to be more widely advocated in the 1900s, the field has been inundated with ideas about what it should entail. It has witnessed a gradual shift from an initial emphasis on the promotion of beauty, convenience and comfort to considerations about improving the living conditions of people, based on issues of social justice and equity. Faludi (1987) asserts that urban planning has traditionally been viewed as a ‘rational’ process. The field has witnessed a significant shift in its use of ‘rationality’ from one which originally focused on identifying future courses of action with regard to the city, but did not provide any reasons for their adoption, to one which now “gives reasons justifying a course of action” (Alexander, 2000: 243).

Urban planning has a profound influence on the wellbeing and quality of life of city residents because of its regulatory authority over the use of land and on other physical resources. Although open to other forms of practice, the term has been more frequently used to describe the process by which the use of urban land is managed for the public good. It is variously referred to as ‘land-use planning’, ‘town planning’, and ‘spatial planning’ (Breuer, 1999). While it has been described by various names in different countries, mirroring their relative contextual distinctiveness, the process has largely remained focused on the physical development of settlements (Breuer, 1999). Central to urban planning is the potential to promote sustainability issues through land-use management, even though it can sometimes lead to unsustainable outcomes in cities.

### **3.2.1 Forms of urban planning practice**

In his review of planning processes in Europe, Breuer (1999: 14) observes three main ways in which urban planning is practiced in many countries that bears relevance to this work. The first reflects a centralised pattern whereby planning responsibility in most countries is concentrated in only one or more planning tiers (at the levels of national and regional governments). The second however involves an even distribution of responsibilities across the different tiers (national, regional and local) of government, while the third is based on an entirely decentralised system whereby planning powers are vested entirely at the local level. Breuer (1999: 15) additionally highlights three features that are common to nearly all planning practices in the world. These include the making of long-term strategic plans (defining the future development path of countries); plan-making (providing an outline of the various development strategies, policies, and activities taken at the different planning scales); and development control (the variety of legal instruments and administrative procedures used to regulate development at the local level).

### **3.2.2 Changes in urban planning practice**

Until the mid 1970s planning practices in many countries were characterised by a strong emphasis on the regulatory role of the state in intervening and controlling specific spatial outcomes in cities. Planning processes for land-use management at this time were therefore based more on comprehensive planning regimes, which had very little effect on policymakers (Tasan-Kok, 2008; Altshuler, 1965). At the heart of this approach was the

belief that through planning, human agency will be able to liberate the world of all social problems. The spatial form that emerged from this logic was the fragmentation of cities based on separate land uses that for the connection, relied mostly on long-distanced transportation networks (Tasan-Kok, 2008: 191). With the oil crisis of the late 1970s, this system of planning gave way to a 'neoliberal'-influenced approach which was engineered by the dismantling of the state, with more flexible forms of planning to support production systems based on the 'free-market'. Because this period witnessed the increased recognition of the active role of municipal authorities in the management of cities, several municipal and national governments, in a bid to attract global investments adopted various market-led instruments as a precursor to the reversal of their roles from 'managers' to 'entrepreneurs'. Although many cities of the developing world still remained less attractive to international investments, such reforms were mainly undertaken in an attempt to meet international donor requirements (Tasan-Kok, 2008).

Central to the dismantling of the state in the wake of enabled markets was the relaxation of planning controls, which were increasingly seen as putting constraints both on human agency and on market forces. This shift from comprehensive planning to land-use management projects involved the focus on specific development projects and a continual review of plans based on new and emerging challenges. In many places, this drive for flexibility in economic systems has produced unpleasant forms of spatial development, as spatial forces in the urban space have "become more difficult to control" (Tasan-Kok, 2008: 185-187). Concerns about this unpleasantness prompted the increased emphasis on a shift to a more strategic approach for the development of cities, based on spatial planning (Meijers *et al.*, 2008). Because the term 'spatial planning' defies any specific definition (Biesbroek *et al.*, 2009), countries have used it to reflect the specificities of their respective planning cultures and traditions. In the context of climate change, the approach has been frequently used holistically, to refer to the wider range of adaptive and mitigation measures used to reduce potential impacts on cities (Biesbroek *et al.*, 2009). It is also seen as a means of coordinating the differing socio-economic and environmental development aspirations of a city.

### 3.3 Climate Change and the Sectoral Nature of Planning

Although planning is seen as fundamental to promoting the city's development process, many of its activities actually take place within sectoral contexts (Biesbroek *et al.*, 2009). Accordingly, sectoral policies take primacy in determining what kinds of development actually takes place within cities. It can be reasoned therefore that planning responses to climate change are, according to this system, "first and foremost the responsibility of these sectors"; while the key role of the urban planner is to coordinate the range of activities involved in the planning process (Biesbroek *et al.*, 2009: 234). Spatial planning can arguably be regarded as having a huge potential to reduce climate change impacts and to promote the sustainability of cities (Biesbroek *et al.*, 2009). Yet, the distinctiveness of each city context in terms of its socio-economic and biophysical processes implies that different experiences will be expected. Biesbroek *et al.* (2009: 236) however argue that while spatial planning can potentially play immense roles in addressing climate change impacts, it will be worthwhile for the field to evolve its own "strategies and perhaps even instruments, legislations and divisions of responsibility [...] to match the characteristics of climate change". They suggest, based on this logic, that the search for responses to climate change might require new sets of institutional arrangements outside the accustomed practices of the existing administrative structures of states (local and national).

### 3.4 Planning Laws and Regulations

As defined by Arimah and Adeagbo (2000: 280), planning laws and regulations are "regulatory procedures for controlling land use development in line with a (defined) plan". Various forms of regulations are used in planning which include land use legislation, the master plan, development plans, municipal bylaws, subdivision legislations, land use plans and zonal plans (Philips, 2007). Van Den Broeck (2008) has described all these regulations as planning tools. This is because they are generally used as a social device to "organise specific social relations between the state and those it is addressed to" (Lascoumes and Le Galès, 2007: 4). Planning regulations play very significant roles in ensuring that development is both regulated and controlled. A major attribute of most planning regulations is the potential to "safeguard, regulate, conserve and disburse land [...] as well as control the character, appearance and arrangement of buildings" (Arimah and Adeagbo, 2000: 280). One key reason why planning regulations are usually applied in cities is to

enforce control over the city's development process with a view to improving people's living conditions. Other reasons include restoring orderliness, especially in fast growing cities which are usually characterised by chaos and congestion, as well as ensuring that the imagined-future set out in the development plan is translated into action (Philips, 2007: 13-16).

Mabogunji *et al.*,(1978) have identified four key attributes expected of all planning regulations. These concern the power to: specify the desired state of development of a place; identify the expected norms to be observed and the sanctions associated with each; ensure that the standards set meet the capacity of those required to comply with them; and maintain a compliance relationship between the principle (authorised planning agency) and the subjects (those affected by it). With regard to the latter, Arimah and Adeagbo (2000: 281) have argued that planning regulations are only responsive when designed with consideration for the existing socio-economic conditions of places and the extent to which people have access to resources. For this reason, it is important for countries to make periodic adjustments to their planning and building regulations. The rationale for this is not to only bring such regulations to terms with the prevailing socio-economic and environmental conditions but to also expunge from them those particular aspects that make them overly restrictive.

Van Den Broeck (2008: 265) has asserted that as tools used for planning, planning regulations are generally embedded in an institutional context, they shape and are shaped by the same context which produces them. Thus, the extent to which planning policies and laws flourish depends not so much on their degree of robustness but rather on how favourable the context is. Damm (2006: 777-782) similarly contends that where effective, planning laws relating to land use and building construction can play important roles in reducing damage caused by climate-related hazards. Planning can reduce hazard threats by taking cognisance of its impacts at the time of constructing houses. The author draws from the case of a hazard-prone settlement in Germany where threats posed by landslides stimulated the identification of the foundation soil (unstable), the nature of the slope (stability), and other geological factors (weathering processes) as being very critical to decisions about where to build a house. Damm reveals however that even where planning laws are properly designed, they will continue to be ineffective as long as enforcement is lacking.

### 3.5 Urban Planning in a Developing Country Context

Okpala (2009) has opined that the planning of most of the world's cities was originally based on the European planning tradition, with its strong emphasis on land use planning and urban design. In much of Africa and Asia, this was in many ways presented as a panacea for some of the growing problems of the developing world, without much regard to the specificities of context. Unsurprisingly, much of this planning system has been subjected to severe criticism over the last few decades. Criticism has been particularly intense in the wake of a growing realisation that planning can significantly influence the liveability of cities if its key dimensions (spatial, environmental, socio-cultural and economic) are fully explored. This call for the broadening of the scope of planning has entailed shifting the focus from traditional planning concerns about land use, to concerns about the promotion of the sustainable development for cities (Friedmann, 2005: 215).

Okpala (2009) has made a number of observations about the characteristics of urban planning in a developing country context. These relate to the enormous challenges faced in cities which urban planners have to contend with. One of these is the unregulated growth and expansion of cities due to increased urbanization. Cohen (2006: 63-64) attributes much of this growth to dramatic changes in the world's economic, political and technological systems. This unprecedented growth in the urban population has often overwhelmed the capacity of cities to provide the services and infrastructure needed to support urban livelihoods. For many cities, this growth has led to increased pressure for land, as shanties and squatters come to predominate, thus intensifying sprawling, congestion, and overcrowding. Obduho (1998) associates the endurance of the informal sector in several African cities principally with the high levels of corrupt practices that characterise the process of land allocation. This view is shared by El-Shakhs (1997, cited in Friedmann, 2005: 196) who asserts that notwithstanding the existence of planning rules, most governments have proved practically incapable of effectuating their enforcement, thus making it easier for land developers and the public to ignore them.

Farvacque *et al.* (1992: 63-64) identify the key planning challenges faced by cities as the existence of obsolete and inappropriate planning regulations and codes; the dominance of the master plan with its undue delays; and the centralization of planning powers in central government (which distances local authorities from the planning process). Other challenges include institutional fragmentation involving the isolation of planning functions

from such other functions as infrastructure and service delivery (which are each separately managed); and a lack of co-ordination between urban planners and financial planners. Friedmann (2005) additionally points out financial inadequacies on the part of local bodies, who are responsible for the provision and maintenance of urban services and infrastructure, as a key problem faced by planning. According to him, many cities have experienced declining investments in their services and infrastructural provisions either because their revenue base is too small or because they lack the requisite capacity to generate the size of funds needed. Friedman also reveals that in addition to the general lack of funds, many cities are challenged by grave institutional inadequacies which have forced significant proportions of their populations to live in sub-standard conditions. He draws from Bayat's (2004) study of Cairo and Obduho's (1998) work on Nairobi, to demonstrate that while urbanisation continues to take place in many cities, urban planning has been limited mainly to those areas occupied by urban elites. Thus, even though low-income residents may constitute the majority of city dwellers, many live mainly in settlements that exist beyond the mechanisms of the city's formal institutions.

### **3.6 The Governance of Planning in the Development of Cities**

The importance of governance in the planning of cities has gained recognition over the past four decades, despite the many interpretations of its actual meaning. Haider (2005: 16-17) for instance described the concept as the inclusion of a wide-range of actors in the "shaping and making of policies" at the city level. It is now widely used to imply that decision-making processes for the city have been broadened out, with a restructuring of the relationships between government bodies. The concept has gained prominence in the field of planning, mainly due to the desire to integrate the many responses to the numerous social problems that emerged after the dismantling of the welfare state (Andersen and Van Kempen, 2003: 77-79). Governance represents a major departure from traditional forms of government, which emphasized the dominant role of the state. As a new system of management, it involves an active role not only for the public sector, but also for the private and voluntary sectors. Its main advocacy is the assumption that actors are willing to engage in partnership with other actors (including the state) in order to "maximise their benefits individually as well as collectively" (Andersen and Van Kempen, 2003: 80-81). This new regime has been unquestionably presented as a more effective strategy to deal

with the numerous social problems that exist both at the level of the city and at the level of neighbourhoods. Its emphasis on bottom-up policies, based on the participation of a collection of actors and driven by a common interest, underlies its core strength.

Urban governance, however, presupposes that marginalised groups and communities will be empowered to actively take up this new role. This certainly entails conscious efforts on the part of governments to enhance the ability and self-confidence of marginalised groups to make the transition from being passive to more active participants in development processes. Such transformation processes, however, necessitate major policy changes as governments are required “not only to listen to the people”, but to also give them a voice at all stages of the development process (Andersen and Van Kempen, 2003). The prime argument for this is that by enhancing their competence, community residents will be able to effectively take care of their lives and to also take the required actions to improve themselves. Moreover, other significant changes will also be required, especially in shifting urban responses away from mainly sectoral activities to integrative policies, that emphasise the role of area-based programmes in improving the well-being of less-privileged groups and communities (Biesbroek *et al.*, 2009; Andersen and Van Kempen, 2003). Andersen and Kempen (2003: 81) point out however that the engagement of partnerships in a governance framework may lead to the restriction of membership to those who ‘can add resources’ to the partnership, thus excluding the less privileged, who are the target of policies. Haidar (2005: 16-17) supports this view by noting that given the large number of actors involved in the running of cities, there can be tendencies for fragmentation among actors in their daily activities.

### **3.7 Urban Planning, Climate Change and the Role of Municipal Governments**

As the machinery of state that is closest to the people, municipal governments are arguably well-positioned to promote the planning of cities by encouraging citizens to participate in local policy and planning decisions. Local municipal authorities can facilitate participatory processes by fostering strong relationships with other urban actors who have the desired technical capacities to address many of the challenges faced in urban areas (Friedmann, 2005; Brugmann, 1996). This new relationship in planning necessitates the involvement of new sets of actors including the private sector, the citizenry and the local community. The

private sector is of particular importance, because of the significant role it has always played in the development of cities.

In terms of responding to climate change, several municipal governments have played demonstrable roles through the design and use of various planning tools to ensure that cities are more sustainably developed. Many have succeeded in providing ‘an institutional voice’ to local people through awareness-raising campaigns and by enhancing their participatory and negotiation skills. Several others are however, still faced with the challenge of modifying their local statutory frameworks to allow stakeholder engagement in urban planning activities (Brugmann, 1996: 376). Brugmann (1996: 366-372) has highlighted a number of considerations for planners when working to address environmental issues at the city level. Even though not directly related to climate change, many provide valuable ideas which relate to responding to climate change. These include the need to recognize people’s local ‘values’, along with their local knowledge; and the significance of engaging local communities in carrying out assessments about how they impact the environment along with how they are likely to be impacted by the effects. Brugmann also emphasizes the need for setting up a sound institutional mechanism for the response process. Central to all these is the need for municipal governments to share power with other stakeholders in the formulation of planning decisions and the willingness to accept decisions that emerge from the planning process.

### **3.7.1 The need for policy integration**

Integrating climate change issues in urban planning decisions and practice is at the forefront of current debates about how to make cities develop more sustainably. The term has been used to emphasize that unless consideration is given to other urban-wide processes when taking decisions about cities, it is inconceivable that land use management alone could reduce the problems faced by cities (Qureshi *et al.*, 2009; OECD, 1996). In the context of climate change, integration represents a more holistic approach to city problems, since it ensures that planning decisions are made that take into consideration the effects presented by climate change. Through integration, cities are made to develop more sustainably by removing the contradictions between urban planning and climate change policies, as well as providing mutual benefits to the various actors engaged with the two disciplines.

The OECD (1996: 51-52) had in fact argued that, while most cities require more robust and far-sighted policy choices in order to improve their conditions, actual plans and policy-decisions are made within sectoral frameworks which are usually less visionary about cities. It argues that given the complex and interlocking nature of the myriad of challenges faced, sectoral solutions may not be an appropriate strategy for cities. It further asserts that the “single problem-single solution approaches and instruments” which underlie such strategies are often problematic, tending to provoke or exacerbate new or existing problems. Qureshi *et al.*(2009: 2-3) unequivocally support this view in their work and emphasize that the reasoning around integrating planning-related policies is necessitated by the complexity of the urban problems which city managers face. They argue that urban problems, if treated in isolation without assessing their relative implications for one another or for other urban processes, can serve as recipes for chaos (Qureshi *et al.*, 2009: 3).

Although not directly related to climate change, Lafferty and Hovden (2003: 12) in their analysis of Environmental Policy Integration (EPI) propose two dimensions of viewing integration which bear direct relevance to this work. These include vertical and horizontal integration. They view the vertical dimension in terms of the extent to which each sector of government has incorporated environmental (in this case, climate change) objectives as a critical part of their individual sectoral goals. The term ‘vertical’ is used in a ‘functional sense’ to illustrate the way public authorities interact with and influence sector-specific actors in integrating environmental objectives in their work. On the other hand, they describe the horizontal dimension as “the extent to which a central authority has developed a comprehensive cross-sectoral strategy for EPI (climate change)”. Such an authority is considered to be well-placed in working with the various other sectors in getting them to understand the goals which it wishes to achieve and of the ways to integrate environmental issues in the overall policy-making process.

Nilsson and Persson (2003: 333-335) have also identified two main ways to investigate how integration is carried out. The first involves investigating it as a process, specifically in terms of how policies are coordinated between agencies; the way governments relate in policy decision-making; the communication processes that prevail; as well as how to effectively incorporate environmental concerns into the decision-making processes of sectors. The second analysis looks at it as a policy output whereby the integration process is analysed based on the “the statements, objectives, strategies, actions and regulatory

instruments” of sectors. The purpose of the latter is to provide an understanding of the extent of negotiations that led to its formulation and how far the policy has inspired “changes in environmental behaviour”.

### **3.7.2 Climate change: the role of urban planning**

Much of the existing literature on climate change and environmental management emphasises urban planning as a key policy area through which to address the impacts of climate change on cities. UN-Habitat (2009) has, for instance, argued that by effectively managing the way development takes place in cities, urban planning can reduce climate change because well-planned cities make efficient use of energy and the urban landscape. Urban planning is thus a very important approach for mitigating emissions and adapting cities to climate change. Urban planning promotes mitigation by facilitating actions to address the unsustainable use of energy in buildings, industries, and transport, through discouraging sprawl, reducing travel distances in cities, and ensuring that building construction and upgrading meets acceptable standards. By creating parks and open spaces, urban planning can also produce multi-functional components that provide essential cooling in mitigation of the urban heat island effect. Moreover, urban planning reduces human vulnerability in cities through the range of adaptation actions it undertakes focusing on hazards and protecting the development of new settlements in unstable locations. Wilson (2006) however points out that for urban planning to effectively address climate change impact, climatic concerns (climate variations and change) need to be made an integral part of the planning process. This needs to be done in ways that make urban planning responses primarily proactive, rather than just reactive. Yuen and Kong (2009: 7) have also reiterated that as the threats of climate change are now more obvious, it is important that the development of cities should be planned with sustainability in mind. The implications of this are that rather than being static, planning must be more dynamic, because any new challenge that climate change raises would need to be integrated into existing plans.

Wilson (2006: 618) observes in a study at the local level in the United Kingdom that despite massive sensitization about climate change, local authorities (professional Planners and Planning Committees) are normally less inclined to consider it in planning processes, owing to its high uncertainties. The American Planning Association (2008) similarly notes

this view in its report about planning practice. Allman *et al.* (2004: 271) highlight that the integration of climate change in planning at the local level is constrained by a lack of support at the political and strategic levels of the central government, and the absence of active social agency to share best practice. This is exacerbated by a lack of awareness at the local level about the socio-economic benefits of addressing climate change. Yuen and Kong (2009: 8) similarly observes that the lack of a clear mandate and the weak capacity for enforcing planning rules at the local level constrains the application of climate change issues into local plans. Other constraints highlighted in the work relate mainly to the lack of vision, the poor implementation of plans, and the weak institutional frameworks that allow the use of outdated laws, regulations and processes in planning.

### **3.8 Reducing climate change impact on cities: the challenge for urban planning**

Slocombe (1993: 289) argues that many of the actions currently taking place to address climate change in cities are informed by policy makers' different world-views about how to make planning more responsive to negative influences on the environment. He identifies from the range of discourses that there are two main strategies for reducing GHG emission in cities. These include the 'compact city' approach, which emphasizes densification as a panacea for the irregular development of cities, and the 'green city' approach with its emphasis to promote "new development [...] as a spatial extension of the city". According to the compact city logic, densification can be promoted by ensuring that the city is able to meet needs for any future development from within its existing current limits. This requires the use of effective land use planning systems and incentives that are geared not only towards reducing distances between functions but to also reduce the use of cars and high energy demand from single family homes. It equally requires various adjustments to the systems of city governance. Jenk and Burgess (2000: 13) observe however that the high densities and overcrowding that dominate the cities of low-income countries make it illogical to undertake any further densification, as it will work to exacerbate congestion and the worsening unhygienic conditions of cities. The green city approach alternatively involves transforming the roles and functions of 'selected' urban sub-centres by promoting the densification and intensification of activity through mixed land uses. This involves the promotion of mass transit routes, and improvements in architectural designs. Central to

this approach is the need to integrate environmental policies relating to climate change with land use and transport planning (Naess, 2001: 507-508; Burgess, 2000).

On the issue of vulnerability, Bernstein (1992: 157-158) similarly suggests that an ideal strategy for reducing climate change impacts is to address the key concerns “within the context of an overall land and environmental management plan”. This involves the use of policies and actions that work both to increase the availability and accessibility of land, based on efficiency and equity considerations, and ensuring also that ecological services and processes are effectively maintained. Of particular note is the premium this strategy places on the protection of environmentally sensitive areas. In particular, the approach proposes a variety of measures to manage hazard-prone areas in cities that can take on board the housing needs of low-income groups. One of these is to limit land development in particularly risky areas of the city and to provide an alternative but more desirable location that is well serviced for residential development. Another option would be to relocate “existing land occupants” with “appropriate compensation” packages. Bernstein argues that in situations where relocation cannot be the best option, development can be allowed in some risk-prone areas, while city managers carry out appropriate infrastructural improvements of the site. Alternatively, such sites can be converted to other uses (e.g. parks), depending on the ability and willingness of city authorities to invest in them. Such management systems however require a collaborative approach to examining the implications for both the government and low income residents of adopting a particular strategy.

### **3. 9 Shortcomings of theory and conceptual positioning**

Based on the various theoretical viewpoints examined in the previous sections, three main shortcomings (in existing knowledge) are identified, relating to the conceptual stance taken by this research. The first is that rarely has urban planning concerned itself with alternative forms of settlement development, outside of the traditional concerns it has for land use planning and the control of physical development (Breuer, 1999). The weaknesses of this approach have long been recognised by numerous scholars, who have advocated the broadening of urban planning’s scope (to embrace the multifarious social, economic and environmental objectives of cities) with a view to enabling cities to develop more sustainably. Recent approaches have extended this call by emphasising the issue of

‘governance’ which is seen by many as a holistic strategy for dealing with the range of problems faced by cities. Governance is presented as a particularly appropriate strategy with which to address climate change issues in that it promotes a response shared between planners and other actors to the myriad of factors that cause or exacerbate climate change impacts. However, in many contexts (particularly in developing countries), physical developments based on sectoral and isolated decisions (land use, infrastructure, and services) have tended to take pre-eminence (Biesbroek *et al.*, 2009) in urban planning practice. While sustainable development and collaborative strategies in addressing climate change problems are widely advocated in planning literature, attention has yet to be given to certain limitations which inhibit planning roles (in the least developed countries relating specifically to inadequate knowledge of climate change, lack of capacity to envision the future changes in climate, and other institutional factors). The lack of a comprehensive literature on the conditions in different contexts is the result of the limited understandings by most western theorists (predominantly Europeans) about the way planning is actually practiced in most developing countries. Because of this inadequacy, many have tended to draw mainly on observations relating to European planning systems to make generalizations about what planning ought (or ought not) to be. This approach, which is the logical concomitant of the historical ties that long existed between the planning systems of a number of developing countries and those of their erstwhile colonial masters has led to a lack of space for locally-generated ideas (and experiences) about what contextual features must be taken account of, in order to enhance planning roles in dealing with the impacts associated with climate change.

The second shortcoming is that attention is rarely given to the kinds of concerns about climate change that planners need to consider when making planning decisions about cities. Because most of the policy-decisions and development interventions in cities are usually made within sectoral contexts, they have a strong potential to exacerbate vulnerability in cities, since their relative implications for one another or for other urban processes are rarely taken into consideration (Qureshi *et al.*, 2009). Considerations about the kinds of knowledge about climate change of which urban planners ought to take cognizance, address complexities about the types of data to be gathered and how, including the nature of the problems to be planned for.

The third weakness in the theoretical review relates to the apparent neglect of the question of how planners should make climate change concerns an integral part of their planning

decisions. In spite of the recent attention that this question has attracted, there is still rarely any hard knowledge for cities in developing countries to learn from. This question is very important since as many scholars have observed (Biesbroek *et al.*, 2009; Tasan-Kok, 2008; Brugmann, 1996), most of the decisions concerning urban development are taken within a sectoral context. This would therefore imply that planning responses to climate change are, first and foremost, the responsibility of the individual sectors. The challenges which this presents to planning activities have led to hints about the need for planning to evolve its own strategies and procedures for addressing climate change (Biesbroek *et al.*, 2009: 236). Other suggestions include the need for planners to involve communities in planning activities and to recognise local knowledge in decision-making processes (Qureshi *et al.*, 2009; Damm, 2006; Corburn, 2003; Brugmann, 1996). To do so has the potential of increasing the quality of planning decisions and the activities targeted at addressing climate change. However, the dominance of Western ideas in the practice of planning and in responding to climate change has contributed to the lack of space in planning for local level experiences and knowledge about dealing with its impacts.

### **3.10 Theorising Institutions**

There is a growing awareness that institutions can have a major influence on climate change, based on how they structure it as a problem and how they devise responses to deal with its impact. Institutions have been variously defined as “humanly devised constraints that shape human interaction”(North, 2009: 3) and as a “multitude of means for holding society together, for giving it a sense of purpose, and for enabling it to adapt” (O’Riordan and Jordan, 1999: 81). They can also be viewed as “sets of formal and informal rules and norms that shape interactions of humans with others and nature” (Agrawal and Gibson, 1999: 637). Institutions generally involve rules which are constructed over time, “have a degree of permanence and are relatively stable”, but are equally, subject to change (O’Riordan and Jordan, 1999: 82). In the main, institutions defy any single description because, while some people view them as enduring aspects of human life (embodying beliefs and values) which shape a person’s behaviour, others consider them in terms of underlying forces in society which work to privilege or disadvantage particular groups or communities. Numerous others perceive them as “the organisations – states, corporations

– that arch over societies and comprise economies and give coherence to both” (Beauregard, 2005: 206).

Peters (2000: 4-5) observes that however defined, institutions (structures) matter because they hold society together. Institutions also persist: unlike individuals, who come and go, they are always there. In order to achieve this, they “attempt to replicate themselves by socialising new members into the values that define the institution”. According to Hoffman and Ventresca (1999: 1371), institutions are fundamental to policy-decision making because apart from the “normative and contextual constraints” they pose, which strongly influence individual and organisational action, “they also contribute the cultural terms and cognitive elements” around which issues are debated. In other words, institutions provide the context both for defining problems and for framing their solutions. They also define the range of possibilities (e.g. policy, strategy) available for individual and organisational action. Institutional theory therefore explores how these limited sets of choices are “shaped, mediated and channelled by the external (institutional) environment” (Hoffman and Ventresca, 1999: 371). In particular, institutional theory is concerned with institutional sources for framing a particular issue as a problem, how the problem is defined, who defines it as a problem, which actors are more influential in its framing, what kinds of responses are favoured and whose interests are more central to the overall process (Hoffman and Ventresca, 1999: 1371).

Scott (2001) distinguishes three prime attributes of institutions, which not only restrain individual or organisational actions but also serve to change organisational activity. These include regulatory, normative, and cognitive attributes. He describes their regulatory attribute as the legal sanction to which organisations subscribe for reasons of expedience. By contrast, he exemplifies the normative attribute as typifying ethical considerations which oblige organisations to demonstrate social responsibility. On the other hand, he regards the cognitive attribute as symbolising “the collective construction of social reality” as reflected in the use of language, or other societal processes that embody public activity. According to Scott, it is these three attributes which serve as the main generative sources of institutional authority. The attributes work either to enhance the durability of existing institutional structures or make them vulnerable to challenge or an eventual change.

Hoffman and Ventrisca (1999: 1374-1376) use this logic to illustrate how the institutional framing of environmental issues is influenced by existing beliefs. In particular, these

authors highlight a finding from a review of the creation of the Environmental Protection Agency (The Department of Environment Ministry of Lands Housing and the Environment) in the United States, to the effect that while regulatory structures mostly compel organisations to compliant actions, such regulations derive in fact from the dominant perspectives that prevail at the time. Such ideas influence both the way organisations are structured in terms of compartmentalisation and the types of approaches they use to deal with problems. Perceptions about regulatory structure also inspire the belief that once articulated, they will ensure the full compliance of all actors. This underlies the adversarial relationships that sometimes emerge between government and organisations regarding the enforcement of rules.

Tenbrunsel *et al.* (1997) similarly adduce that regulatory institutions (structures) lock individuals and organisational actors into a compliance mindset rather than allowing them to search for creative solutions to environmental problems. They assert that for many organisations, a compliance mindset mirrors what is presented as the accepted wisdom for organisational action as set out in the bureaucratic procedures, standard operational procedures or best practice procedures. The regulatory structures also define which environmental concerns (problems) organisations should address, the extent to which this should be done and how. Hoffman and Ventresca (1999) also point out that because compliance structures are largely unable to recognise or reward creativity since they merely require personnel to follow established rules, they may open up possibilities for self-serving individuals, either intentionally or unintentionally, to use regulatory structures in ways that are “at odds with wider societal interest”. They argue that any attempt to alter or seek alternatives to such structures (regulatory) will involve a change in the “normative and cognitive institutions on which they are based”. This is essentially because the regulatory issues:

*are anchored in the constellation of beliefs, organisational routines, policies and practices that have accumulated over [...] years of organisational and programmatic routines and have defined the nature of the environmental problems and the form of their solution.* (Hoffman and Ventresca, 1999: 1381).

Thus while it may seem easy to change regulatory attributes, it is often practically difficult to do so, because any such change will require attention specifically in terms of the cognitive aspect which actually perpetuates the collectively constructed perceptions about the environment which get embedded in regulatory practices. Hoffman and Ventresca

(1999: 1374) therefore propose two frameworks for promoting change within established policy regimes. These include either working from within current discourses in a bid to restructure competing interests “in terms consistent with those interests that dominate”, or to entirely replace existing institutions based on “a new set of beliefs and actions”.

### **3.11 Collaborative planning theory**

Many of the ideas around collaborative planning theory are attributed to the seminal works of Patsy Healey, who has extrapolated them in a range of books of that name. The theory emerged as a leading theoretical construct in the late 1990s, mainly in response to the difficulties that characterized the use of top-down hierarchical approaches in the provision and delivery of urban services and infrastructure. Although not framed specifically as a theory given its strong orientation towards community organisation and action, collaborative planning has frequently been presented theoretically as an adjunct to the communicative planning thesis (Allmendinger and Tewdwr-Jones, 2002: 22; Healey, 1997). This approach which challenges sectoral divisions in the delivery of services and between public and private provision, emphasises the need for partnership and collaboration in the management of cities. While collaborative planning is still seen by many as a challenge to ‘normal’ ways of doing things, it has in reality, proved to be very difficult to resist, given its popularity since the 1990s.

As an approach to the management of cities, collaboration is in effect not new, given that even before its induction, a lot of direct organisational lobbying and partnerships existed, particularly in the development of policies. What is new about the collaborative planning approach relates to two fundamental issues (Healey, 2003: 104). The first is the presentation of planning as an interactive process, which involves the action of a variety of ‘stakeholders’. This is related to the second, which views planning as a governance process, whereby communities are managed “in complex and dynamic institutional environments” with the interactions shaped (but not determined) by wider socio-structural forces. Closely related to these is a concern about how planning policy initiatives work to support social justice, particularly in decisions “about resource allocation and (about how) regulations are articulated and implemented” (Healey, 2003: 104-105). Collaborative planning is more practice-based, given the recognition it gives to the power that communities can exert in improving the quality of local settlements. Its underlying goal is

to ensure inclusiveness in plan-making as well as bring to light the importance of ‘place’ and the diversities of culture that are frequently overlooked by traditional forms of planning.

One key assumption of this approach is that through collaboration, planning practices will become more democratic with communities becoming increasingly empowered as they are brought on board the planning process to reason together. Underlying this is the belief that through collaboration, different forms of knowledge and reasoning can be shared to promote social learning, enhance capacity and remove institutional barriers to creative actions. The assumption that collaboration is sufficient to remove the rudiments of power that pervade the planning process has brought the approach into sharp scrutiny with many critics accusing it of having ignored, rather than engaged with, the power relations that permeate the practical context in which planning processes takes place. As Healey (2003) later pointed out, whilst it is not the purpose of collaborative planning to eliminate the workings of power, it ensures that planning activities take place with very little influence of power. Other criticisms relate to the idea that while the approach gives attention to place in terms of the historical and cultural forces that are at play, there are particular contexts which do not provide the right conditions for collaboration to take place. Nevertheless, Harris (2005: 33) has associated collaborative planning with a number of positive values which include its intimate link with contextual (“the nature of particular places and systems of governance”); and structural (“institutional organisation”) issues, in addition to the normative agenda, which emphasises the need to make planning more effective.

### **3.12 The Conceptual Framework**

From the scholarly discourses and theories reviewed, it was possible to evolve a coherent picture of the complex relationship that exists between human activities and climate change, and the capacity of urban planning to moderate such impacts on cities. An important aspect of this understanding was the need to develop a schematic frame that shows how human activities in cities can lead to climate change through the emission of GHGs and how the impacts on cities will be influenced by the existing state of vulnerability. Equally important was the need to show how the processes which lead to climate change and those which exacerbate its impacts can be addressed through urban planning responses. The conceptual framework is therefore developed based on five key

components. These relate to: 1) structural causes, 2) hazard exposure, 3) settlement sensitivity, 4) adaptive capacity, and the 5) means for integration. This conceptualisation therefore required the use of a framework to investigate the conditions and factors which both influence and drive vulnerability and GHG emissions in cities as well as the specific conditions which shape exposure to hazard risks and the capacity for individuals and society to take adaptation actions. As the conceptual framework is based on a synthesis of the complex relationship between cities, urban planning and climate change, it was obvious that a more complex approach was required, since a simple framework would not be adequate to cover all the issues.

In taking the discussion forward, it was possible to construct a working definition for each of the five components of the conceptual framework. As will be the approach used in this thesis, structural causes are to be viewed in terms of deep-rooted factors, in a social context which influences the nature and form of vulnerability in cities, along with the size and pattern of emissions that take place. It also shapes and constrains the choices for adaptation and mitigation actions at the household level as well as the city. Structural forces (socio-demographic, economic, political) are expressed in diverse forms (age, gender, wealth), mainly in ways which serve to favour particular groups over others. Hazard exposure is described as being prone to a potentially harmful climatic event that may cause damage due to unsafe conditions. Settlement sensitivity (otherwise referred here as the unsafe conditions) is viewed in terms of the factors that make humans and their properties susceptible to the effects of climate change in cities. Unsafe conditions result largely from structural causes and it is these factors that determine the differential impacts of climate change among individuals and places. Adaptive capacity refers to the range of actions and adjustments needed in development processes to enable cities to cope with or adapt to expected changes in climate. Adaptive capacity is seen here as the sum of actions taken at levels from the individual to the national, which also include all urban planning adaptation actions. These activities are influenced by a number of forces, including the institutional environment for planning, managerial ability, infrastructure, and access to resources (Smit and Wandel, 2006: 287). Means of integration can be viewed as the specific approach used for making the relevant climate change concerns an integral part of planning activities. Integration can be carried out at any level of state, depending on where planning activities are undertaken.

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The important aspects of this framework are the interconnections between cities, climate change and urban planning, the key climate change concerns for cities, and the available policy responses for planning in dealing with the impacts. An important feature of this framework is the highlighting of the structural issues and the distinctive nature of places, which provide the context for how urban planning responds to climate change. The conceptual framework thus sets out to illustrate the important interrelationships that exist between these various aspects. An attempt to infuse an element of institutional and contextual awareness into climate change-response planning discourses highlights the significant role external factors play in shaping opportunities for local level actions. As emphasised in this framework, climate change impact for cities (couple human-environment system) is considered to be a function of the interrelationships between the system's internal and external characteristics. The internal factors are driven by the emission of GHGs, the hazards that the system is exposed to, as well as its existing capacity to cope with, recover from, and deal with the impacts. These factors determine the extent to which systems are affected by climate change impacts. However, the likelihood and scale of urban planning responses (mitigation and adaptation) in tackling the impacts in cities will be shaped by such external structural factors as national policies and laws. Thus, while vulnerability is used here primarily in an internal sense to refer to the inherent conditions of cities, it is recognized that external influences also play a part.

## **Chapter Four**

### **Research Design and Methodology**

#### **4.1 Introduction**

The two preceding chapters examined assumptions of the theoretical and conceptual frameworks that underlie this thesis. This chapter discusses both the philosophical underpinnings and the practical elements that form the basis of the research design. The chapter progresses from a detailed engagement with the ontological and epistemological foundations of this work to a discussion of some key issues relating to the choice of the research methodology. The data collection method is also described, including the approach towards data analysis. The chapter ends by examining the method used to assess the vulnerability of Freetown to climate change impacts. Details of the research process and discussions are hereby provided.

#### **4.2 Research Philosophical Positioning**

One of the principal requirements of social science research is the need to conceptualise the nature of social reality and how one can know about that reality (Danermark et al., 2002: 246). This involves holding a necessary discussion about the relationship between widely-accepted views about climate change (ontology) and how such knowledge shapes our limited understandings about the impacts that climate change imposes onto urban settlements (epistemology). Ponterotto (2005: 130) shows that when conceptualising ontological issues, the principal engagement should be with the question “what is there to know”. In the context of joint social-ecological systems like cities, this would require a detailed examination of the critical forces which both drive and condition cities to the predicted effects of climate change; along with an exploration of how the deeply-embedded processes which shape planning’s response to climate impacts are constructed and undertaken. Articulating the ontological position provides profound clarity to research, as it makes explicit the researchers’ assumptions about the world.

Whilst ontological approaches are heavily contested, realism, idealism, objectivism and constructionism are among the taken-for granted ways of knowing the world in planning-

related research. Yet, as there already exists a large body of literature on this subject, it is outside the scope of this work to engage in an extensive examination of all the different ontologies. As this research is about making climate change considerations an integral part of urban planning decisions, its underpinning ontology is the realist ontology which accentuates the belief in the existence of an independent reality (for general reviews on ontological approaches in social science research, see (Campbell and Wasco, (2000); Bernard, (2000); Becker, (1996); Willig, (2001); Bryman, (2001); Lakoff, (1987); Houston, (2001), and; Procto, (1998)). It specifically takes the critical realist approach which assumes a socially constructed reality that is mediated by the underlying structures and mechanisms of society. Central to this ontology is the potential to ascribe causal powers both to human reason and social structures (Sayer, 2000; Sayer, 1992). Thus it is proposed that while the concept of climate change and claims about its impacts are socially constructed, the ways in which responses are framed and the types of actions taken at any given time are socially mediated. Viewed in this way, the critical realist ontology would therefore seek to uncover the causal mechanisms of the dominant processes which make Freetown susceptible to climate change and the contingent conditions which shape the context within which adaptation and mitigation responses are framed as urban planning issues.

Epistemology is similarly described by Willig (2001) as relating specifically to the researcher's assumptions about knowledge as reflected in such questions as "how do I know what is there in the world"? Engaging with epistemological concerns therefore, involves "thinking about the nature of knowledge itself, about its scope and about the validity and reliability" of knowledge claims (Willig, 2001: 2). As part of the epistemological reflections about the nature of knowledge in this research, this work focuses on asking two important questions that are foundational to the research aim. The first relates to the question: "what are the current systems for managing urban planning and climate change and who are the key actors?" This question is important because it provides an understanding of the various actors who are involved in the two activities in Freetown, and the scope of their individual responsibilities, in addition to how the actual management processes work. The second question is: "what are the barriers to incorporating climate change into existing planning processes and how can this be overcome?" This question investigates how urban planning processes and the management of climate change are either enabled or constrained. It identifies the existing gaps in the

incorporation of both processes and explores ways by which the two can suitably be integrated.

While different types of epistemologies exist (positivism, empiricism, rationalism, realism), this thesis adopts the critical realist approach, which is predicted on the belief that even “though there is an ultimate truth, it can never be fully known” (Hoffmann, 2005: 2). This can for instance, imply that while we can know that human activities are increasingly contributing to Freetown’s vulnerability to climate change impacts, we can however, only partially know the extent of this damage and the potential impacts that it will have on communities. In other words, it is impossible to rigidly associate particular causes or outcomes with climate change outcomes, given the complex interrelationships taking place at any time within the urban system. As such, any meaningful solution to climate change must be found by addressing the tendencies which actually give rise to it. This position relates back to the ontological concern of understanding the causal mechanisms of climate change, with a view to providing an explanation of it through a structural investigation of society.

### **4.3 Research Design**

This research is designed based on the use of a case study. Creswell (2009) describes research design as the plans and procedures used in carrying out a study. It involves making specific decisions about research from the time of its conceptualisation to the point of completion. The way a case study research design is structured is determined by a range of factors. These include the nature of the research problem, the researcher’s assumptions about the world, the methods of data collection, the analytical and interpretative framework, and the researcher’s individual ability (Creswell, 2009: 3).

Yin (2009) identifies five main characteristics of a case study research design, which are worth considering in this work. The first relates to the framing of clear research questions. The research question not only establishes the research purpose, but also specifies what evidence gets collected in order to effectively link the propositions of the research with the final conclusions drawn (De Vaus, 2001). The second characteristic relates to the selection of the case that is to be analysed. While case study research may involve the use of a single or multiple cases, it is possible to find cases with more than one attribute. To develop a

holistic understanding of the case would therefore require a detailed examination of all of these attributes. Yin (2009) identifies data collection as the third feature of a good research design. He describes it as the process of specifying the particular type of data that is needed through the use of clearly-framed research questions. Yin points out in particular that for such interdisciplinary studies involving planning and environmental management, the case study research design is very appropriate because it supports the collection of data from multiple sources. Yin's fourth prescription of a good research design emphasises the analysis and interpretation of data. Data analysis not only enhances the researcher's understanding about the study phenomenon but it also enables him to draw inferences about causal relations among various research variables. According to Yin, the final stage of a good research design is to report the relevant evidence of the research in very dispassionate and convincing ways.

In line with Yin, this research has been designed based on a clear identification of the information that is needed for this study. It draws mainly from the research purpose and aims, to develop a range of research questions which were used to investigate the case study. As was demonstrated by the variety of field research questions and techniques, the specification of data was important, as it enabled the researcher to link the evidence of the study with the overall propositions of the research. Related to this first procedure was the importance of identifying appropriate data sources for the research. This entailed selecting relevant study areas that allow the collection of the required information to standards meeting a level of rigour that will satisfy the expectations of the research. The identification of the data collection approach, along with the instruments used to collect the data, was preceded by the selection of a sample of the population that the research sought to describe. This entailed recognising the different voices of actors engaged in urban planning and climate change management at different levels of the city, in addition to the local residents who are likely to be adversely affected by climate change. The selection and the application of an analytic technique based on a sound validity and reliability check paved way for the interpretation and reporting of the research findings.

#### **4.3.1 Reason for choice of the case study research strategy**

A case study research strategy is used for investigation both how urban planning and climate change are managed in Freetown and how the key climate change considerations

can effectively be integrated in urban planning decisions and processes. A distinguishing feature of the case study strategy is that it allows a detailed contextual analysis of how the potential hazards of climate change could impact on the development of cities. This is particularly important for Freetown, where as a result of unplanned urban growth and the prevalence of weak and inappropriate urban planning laws and policies, several settlements are now increasingly being made vulnerable to the adverse effects of climate change. A contextual examination of Freetown in terms of the potential impacts which climate change will pose enables an understanding of why human responses to the same hazard event differ widely among places and categories. This study, therefore, falls under the domain of contemporary research because of its focus on crucially emergent issues relating both to the environment and development thus underlining the interdisciplinary setting of the research. The earlier chapters have discussed some of the critical scholarly postulations about the often-negative ways in which man has interacted with his surroundings. In cities, just as the various forms of human activity that cause GHG emissions differ, so does the range of response actions taken by diverse actors at different levels to deal with the impact. This study therefore, provides a contemporary view of the processes that characterise climate change.

## **4.4 Sources of Information**

### **4.4.1 Selection of Institutions**

A number of institutions were examined to provide the researcher with a complete picture of the urban planning process in Sierra Leone and the way climate change is managed. This also involved an analysis of the causal processes of vulnerability, along with the emission of GHGs. The institutions chosen for this study at both the local and national levels were those that are either actively engaged in urban planning (policy and practice) or that have climate change, disaster management or sustainable development considerations as part of their mandate. The rationale for investigating these institutions was based on the investigator's assumption that to develop a holistic understanding of the vulnerability of Freetown, including the way GHGs are emitted, it is important to examine the various aspects that give rise to it. This assumption is underpinned by the argument that the causes of climate change and the responses that deal with its impacts do not take place in an institutional vacuum. An analysis of the institutions therefore, provided a

detailed and clear understanding of how these various processes have worked to position Freetown, in terms of how likely it is to be affected by climate change.

The selection of institutions was preceded by a preliminary analysis of a number of processes that had been undertaken in Freetown which had implications for both urban planning and climate change. This was to determine what institutions are involved in planning or climate change that is appropriate to this study. Overall, 27 institutions were purposively selected, based not so much on their statistical representativeness, as on their potential to produce the required knowledge for this thesis (Wamsler, 2007). Only 18.5% of the bodies selected were at the local level, since so many of the planning and climate change-related activities in Sierra Leone are carried out at national and sub-national levels. Research with formal institutions<sup>3</sup> involved the use of semi-structured interviews with some selected respondents who were at the senior management levels of their respective institutions (see Appendix A). The enquiry initially focused on the Ministry of Lands, Country Planning and the Environment (MLCP&E), the Freetown City Council (FCC) and the Climate Change Secretariat (CCS), but was later expanded to include other professionals that were selected from some government ministries and agencies (at the national scale). Other institutions that were similarly interviewed included community Based Organisations (CBO's), Non-Governmental Organisations (NGOs), research and academic bodies, professional organisations, international organisations and multilateral and bilateral aid agencies.

Focus group discussions were additionally held at the community level with a purposive sample of three informal groups drawn from each community. These consisted of area-based groups, community based organisations and other civic organisations (see Appendix B). The purpose of the focus group was to corroborate some of the perspectives presented in the administered questionnaire and to also see things through the eyes of the communities being studied (Gaber, 1993: 139).

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<sup>3</sup> Agrawal and Arun (2008: 24) have shown in a World Bank Paper that institutions can be classified in diverse ways. He shows that classifications are normally made based on some specific features that are seen to be 'most relevant to institutional design and performance'. He argues based on this logic that it is also possible to classify 'local' institutions in diverse ways.

#### **4.4.2 Selection of residential dwellings**

This study also involved the administration of two hundred (200) structured questionnaires to an equal number (50 each) of household heads selected from four communities that comprised the embedded cases (see Sections 5.4.2 to 5.4.5) used by this research. However, the sampling technique used to select the dwellings of these households differed. This was necessary because of the remarkable differences between these settlements, whereby unlike the formal settlements (Aberdeen and Kingtom), the informal settlements (Kroo Bay and East Brook) are haphazardly developed, with hardly any laid-out streets. Prior to the respondent selection, a pilot study was undertaken with household heads, as part of a reconnaissance to test the feasibility of the idea. This also involved taking an inventory of all the streets within each settlement (Aberdeen and Kingtom) from which a sample of 12 streets each (39% and 45% respectively) was randomly selected for the choice of residential dwellings to be approached. The actual approach used for selecting the dwellings in these two settlements was the systematic sampling technique. This involved the initial selection of the second house on each listed street from which, every fifth house was selected in turn (2, 7, 12, 17...) until the street came to an end before restarting the whole selection process on another street. Depending on the street lengths and the total number of houses that were situated on them, between 9 (nine) and 11 (eleven) streets were studied overall. This technique was considered suitably appropriate, because it allowed equal probability for every household to be selected.

On the other hand, in the informal settlements a different method had to be used. The selection of residential dwellings in the informal settlements was based on the use of updated registers held by the community leaders of each of the two settlements. These registers provided records of all plotted areas that are occupied, including basic details of the households. Unlike Aberdeen and Kingtom, a systematic sampling approach was not possible here, given that these settlements have not been traditionally planned. Two main criteria were used to reduce the sample size prior to using a random sampling technique to choose the dwelling houses approached for the study. The first was to select only dwellings that have been occupied in the last two years, while the second was to select dwellings with households that have lived in the settlement for at least five years. This category was preferred because they are considered to be more knowledgeable about prevailing hazards, including the main responses taken by community residents.



Figure 4: Study area locations in Freetown

Source: Google Earth

#### **4.4.3 Selection of households for surveys**

Although more than one household was sometimes found in some dwellings, only one household was selected for interview, with the questionnaire being administered to the household head. In line with McDonough and Amicklii (2001), the household head is used here in the traditional sense to imply husbands in married-couple households and male or female residents in single-headed households. This work could have used other determinants (income, employment) in the definition of household heads, given the global increase in the number of female-headed households in the last few years (Asgary and Pagan, 2005: 94). However, because polygamy is commonly practiced in the male households, it was difficult to define who to select among the different wives, since each was practically eligible for interview. The choice of the above-stated definition was therefore appropriate because by selecting only one person from the household to provide data, a lot of time and resources were saved on the part of the researcher. For dwellings with more than one household, only one household head was selected, using a simple lottery. This involved writing the names of the various households on different sheets of paper which were then folded and placed into a box from which one was pulled impartially to form the sample. Households were the focus of this survey because household heads seemed best placed to comment on reasons for living in either hazard-prone areas or in more stable settlements. They are also considered knowledgeable about the reasons that they are able to cope the way they do. In situations where the *de jure* household head was resident outside of Freetown, a *de facto* head (the person responsible for daily decision making, or for the daily upkeep of the home) was asked for among the household.

#### **4.5 Data Collection Methods**

The data collection methods used by this research are both qualitative and quantitative in design, reflecting the mixed methods research design. Hanson *et al.* (2005: 224) argue that mixed methods research provides a holistic understanding of a study phenomenon by allowing the researcher to explore and analyse data from different perspectives. Accordingly, information for this research will be collected from different sources involving the use of both qualitative and quantitative (structured and unstructured) techniques. A qualitative research study is particularly useful in the investigation of people's perceptions and their lived experience as they relate to particular events. It is also

important for understanding the meaning which individuals attach to a social phenomenon (Creswell, 2009; Gaber, 1993). Quantitative research on the other hand, allows the use of the social survey to undertake measurements and to determine causality (Bryman, 2004; Casebeer and Verhoef, 1997). The joint approach specifically investigates a social system to determine what makes things happen (or fail to happen) in particular contexts, and what kinds of relationships exist between the key properties of that system. A blend of qualitative and quantitative methodology was considered appropriate for this research because it offers the power to abstract a desired level of detail from the data, that enables a better understanding of the research problem.

While the quantitative and qualitative methodologies have traditionally been presented as incompatible, owing to their competing paradigmatic positions, it is now widely accepted that they can work together (Johnson and Onwuegbuzie, 2004: 17). A blend of the two approaches is more appropriate, where either the quantitative or qualitative approach alone is inappropriate to providing a better understanding of a research problem. Moreover, this joint approach can help to reduce the bias associated with the sole use of either of the two approaches (Creswell, 2009: 14; De Vaus, 2001). Because the joint approach allows a detailed description of the study situation through the collection of data using a variety of methods, it is therefore considered to be highly appropriate for this study.

#### **4.5.1 Quantitative data collection method**

The quantitative method is a valuable technique for collecting data that provides a general description of a study phenomenon (Thomas, 2003: 2). In this case, it involved collecting and measuring data to show how household perceptions about current risks and vulnerabilities are distributed within the study population. Sections 4.4.1 to 4.4.3, above, have discussed the sample size and the sampling procedure and methods used in this study. Since the focus of the research was to establish both the factors that underlie the vulnerability of households and the cause and effect relationship, the survey method was considered appropriate for this purpose.

### 4.5.2 Statistical Survey

The statistical survey method used by this research involved the use of structured and predefined questions to provide quantitative information about residents of the four embedded cases. In each case, information was collected based on the use of population samples to allow cross-scale analysis to be made (Creswell, 2009: 12) on the state of vulnerability of the study settlements. An important aspect of this method is its openness to different kinds of qualitative research methods. More on the qualitative side, open-ended questions were also included. The questionnaire was particularly useful for collecting information about how respondents perceive their current vulnerability, the different climatic hazards faced, along with how they and the city authorities deal with the effects. One advantage of the statistical survey is the possibility of examining a phenomenon in its natural setting. It was particularly suitable for providing answers to such research questions as ‘what,’ ‘how much’, and ‘how many’, especially when it did not require the researcher to control the independent and dependent variables (Pinsonneault and Kraemer, 1993). The approach used in carrying out this method was based on the personal interview technique as described by (Ott and Longnecker, 2010: 99). This required the researcher and his team<sup>4</sup> to ask a set of predefined questions using a printed-out questionnaire (see Appendix D). The questions were both open-ended (requiring the respondent to compose the answer) and closed-ended (with pre-coded response options for the respondents to choose from).

Questions were generally open-ended where the possible answers were unknown, while closed-ended questions were used in cases where the researcher had already determined the possible responses (Kelley *et al.*, 2003). The responses were clearly recorded on the questionnaire in the presence of the interviewees. This technique was very suitable for collecting data on individual’s perceptions and experience with hazards, since such information is not readily amenable to observation. In the design of the questionnaire, care was taken to structure the questions in ways that would increase the response rate. The questionnaire was also well sequenced and ordered, with questions having similar content placed adjacent. Prior to making the final printout, the first and second drafts of the

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<sup>4</sup> The questionnaire for this study was administered with the aid of three hired university lecturers. The first two days involved training and preparation whilst the actual survey was done in the remaining five days.

questionnaire were each subjected to pre-tests in order to determine how well the questions were able to measure people's perceptions and their experiences with hazard risks. The questionnaire was administered on the same day to all respondents of each of the four settlements. This was intended to reduce intercommunication among the respondents and the tendency for respondents to be influenced by each other's answers (Krosnick, 1999: 542).

### **4.5.3 Qualitative data collection methods**

Qualitative research methods are a powerful tool for gaining in-depth information about the ways urban planning and climate change are managed. They are particularly useful because they provide a detailed understanding of the shared meaning and relationships among actors in the way that climate change is addressed. When used with other research methods, qualitative instruments can generate valuable details usually left out by quantitative surveys. Often, qualitative methods focus on those "aspects of human behaviour not easily explainable by rational analysis" (Needleman and Needleman, 1996: 330). Cavana *et al.* (2001: 137) identify the most frequently used qualitative research methods as interviewing, focus groups and observation. Qualitative research methods were used in this study because of the attention they give to meaning-making based on the range of experiences of respondents.

### **4.5.4 Interview**

The semi-structured interview technique was one of the qualitative research methods used to collect data for this study. It involved the use of a list of predetermined open-ended questions to probe the worlds of a number of interviewees (officials, professionals, academics and development practitioners) deemed to be in possession of valuable information required in this research. The questions were prepared based on some salient clues developed from the household survey that was earlier administered, and included other important concepts explored from a review of the literature. The professional heads of the various bodies visited for this study were given first priority as interviewees. Other senior management staff were, however, interviewed where this was not necessary. Throughout the interview process, each respondent was continuously engaged "to think and to talk" with the researcher, who in turn, recorded the relevant details using an

audiotape for which permission was always sought (Nunkoosing, 2005: 698-699; Dilley, 2004: 128-129). Questions were asked from a list that had been designed in advance to guide the interview process (see Appendix C) and the discussions were carried out in an unbiased, conversational and ‘non-threatening’ manner (Yin, 2009). A key feature within this process was the flexibility it allowed the researcher to sort out subsequent questions (based on need). Some of the questions were intended to corroborate particular claims that had earlier emerged from the household surveys. The interviewee’s account was however treated only as a ‘verbal report’ which had to be corroborated by cross-checking with people who held different viewpoints (Yin, 2009).

During each interview session, the opening question was deliberately kept very broad and open-ended to allow the interviewee to provide as much information as possible. Where necessary, some aspects of the question were either repeated, or prompts were “used that repeat the words” of the interviewee. This was to allow clarification on some of the assertions made (Spradley et al. cited in DiCicco-Bloom and Crabtree, 2006: 317). Since the informants were generally interviewed both independently and in private, they felt very confident to discuss a number of sensitive issues about their work situation which they may not have discussed if spoken to together as a group (Kelly *et al.*, 2001: 8). It was difficult to determine the precise duration for each interview session. Nevertheless, the interview sessions continued until no more new information could be added to the pool of data collected. This was observed when the answers from respondents became increasingly similar to those already provided by other respondents. At the end of every interview, the transcript was crosschecked with the interviewee to ensure that all the information recorded was exactly what he meant to say. The thoughts that were triggered by these discussions and the questions that were not adequately answered were incorporated into subsequent interviews. This iterative process was considered very valuable because of the guidance that it provided in deciding which directions the researcher should further explore in the succeeding interview questions.

#### **4.5.5 Focus group discussions**

Focus group discussion was one of the qualitative research methods used to collect data for this study. Lewis (1999) describes the focus group as a carefully planned discussion which tries to get the views of participants on a certain research topic in permissive and non-

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threatening ways. The focus group was used because of its power to provide a better understanding of how people in the four case study communities perceive their individual risks and exposures and how such knowledge is informed by their awareness of climate change. The focus group sessions were held in the form of interviews, whereby the researcher investigated the views of groups of between 5 and 18 community members. These people were drawn from among the local community groups, identified as being very active in promoting the interests of the various communities in which they operate. These people were selected because they are the most informed residents in their respective settlements, being closest to the everyday activities that take place (Kelly, 2003). Five focus group sessions were held in all, with the first four sessions conducted immediately after the survey phase was complete. The purpose of holding these discussions in each of the communities investigated earlier was to triangulate some of the important claims made by household heads. The fifth session, which brought together all the community groups, was conducted following the completion of the interview phase. The rationale for this second group discussion session was to cross-check with the community members a number of important ideas that had emerged from the interviews conducted with a number of state and non-state actors. Each of these focus group meetings was organised by the researcher, who also served as the moderator. These sessions were important because they allowed the researcher to see things through the eyes of the community residents themselves. (Gaber, 1993: 139).

During each of the discussions held, participants were engaged in sharing their thoughts, experiences and feelings about the hazards that occur, the reasons for the damage that takes place, the degree of community organising, and the actions frequently taken by individuals and groups to protect themselves. These discussions were held based on the use of semi-structured questions which were both predetermined and open-ended (DiCicco-Bloom and Crabtree, (2006: 315). Morgan (1988, cited in Kleiber, 2004: 90) has observed that the focus group can generate valuable knowledge where the moderator is able to stir up thought processes among the participants to make them more aware and conscious of their own views and ideas around the issues discussed. The moderator's role was therefore very central in generating and sustaining discussions among groups and the interactions that occurred throughout the interview process. This had the effect of transforming the discussions from an ordinary meeting to a detailed conversation where individual experiences, ideas and opinions were shared, challenged and reshaped (Madriz,

1998, cited in Kidd and Parshall, 2000: 294; Kitzinger, 1994). As each participant was allowed to actively contribute, with the freedom to either agree or disagree with alternative views, it was possible for them to share the full range of their experiences and views with the group (Walston and Lissitz, 2000: 476) . The relevant details that emerged from each session were both audio recorded with their permission, and written down in the form of text. It was however difficult to take a visual recording of the interactions that occurred within groups since apart from the small digital camera used, no other visual system was on hand at the time of the study (Clifton and Handy, 2003). Nevertheless, a description was made of these interactions along with the group dynamics. This was based on the assumption that knowledge is socially produced in spite of our standpoint that reality exists independent of such social interactions (Kleiber, 2004: 89).

#### **4.5.6 Direct observation**

The observation method proved a valuable research technique for collecting the data used in this study. It involved watching and noting down particular behaviours of individuals, in addition to recording certain important details about the research setting (Polkinghorne, 2005: 143). The approach used was the direct observation method which involved direct field visits by the researcher to the four case study settlements. The researcher, however, had to always appear very unobtrusive in order not to bias the observation. Although regular visits were made, sometimes field visits were timed to correspond with particularly important incidents (extreme rainfall, flooding, cleaning exercises, and meetings) at which point, more valid evidence was collected. The specific focus of the observations was to examine people's living and working conditions in addition to the range of adaptation and mitigation activities they undertake. Other environmental issues relating to sanitation and drainage along with organisational decision-making processes were also observed.

Data from these sources were valuable because they provided valid information about how a household's socio-economic conditions (poverty and deprivations) influenced their relative exposure to hazards and the constraints posed on their individual abilities to cope. It was also possible to clarify some important claims made in the surveys along with the interview technique. Because the researcher always had chance to record or note down his observations immediately as they occurred, it was possible to collect more accurate information on people and their environment (Foster, 1996: 59). The method also allowed

data to be collected on the behaviour of many people who were not considered for the survey method. This method was considered appropriate because it allowed information to be collected on various aspects of people's behaviour in the very communities where they lived, without the researcher's presence having any significant effect on their behaviour.

#### **4.5.7 Documentary review**

To crosscheck some of the information gathered using the interview approach, a documentary review was carried out. The documentary review required the researcher to identify from a range of data sources to establish to what degree the practices of each institution as represented in the relevant interviews reflected what is portrayed in its official policies and documents. The documents reviewed included institutional policies and regulations, government reports, institutional records, and reports by various other private bodies included in the interviews. These documents were reviewed taking into account the prevailing histories and contexts in which they were created (Fitzgerald, 2007: 279). Apart from a few CBO's which did not have sufficient documentary information about their activities, adequate data was collected from most of the bodies from which it was sought.

Central to the documentary review process was the abstraction of the relevant points of a document in a concise form. This involved reading and gaining an understanding of the content, locating the essential parts, making written notes on them and developing those notes more clearly and concisely (Molina, 1995: 1-2). The use of documentary review was appropriate for this study because it provided insights into the past, in terms of how urban planning and climate change activities were previously organised in Freetown. This generated questions regarding what might account for the current changes in the approaches used and the framework for addressing mitigation and adaptation issues. It is important to point out that none of the information collected through this method was taken at face value, but each document was subjected to further scrutiny in order to minimise bias. It was however, very difficult to locate some important planning and environmental policies and legislation owing to the country's poor handling of historical records and the inadequate documentation systems. One such document which could have provided valuable information about the way urban development policies and plans may

have influenced the spatial development of Freetown is the 1961 Freetown Development Act.

## **4.6 Data Analysis and Interpretation**

The complexity of using a combination of methods to collect data for this research presented both potentials and challenges for the data analysis phase. The analysis focused on a detailed examination of the data to discover and describe the vulnerability of settlements and the structural elements that constrain planning responses to climate change. Priority was given to the qualitative data at both the data collection and analysis stages. The quantitative method was accorded less priority since it was largely used to provide supporting information and insights into the study settlements. This involved the identification of a range of issues about households which needed to be pursued further, using qualitative data collection methods. It nevertheless proved very valuable in providing some of the required information to fill the data gaps left by the qualitative research methods. Each data set was analysed separately and the results transformed to provide a more detailed understanding of the 'case'. Analysis of the quantitative data set consisted of descriptive procedures to provide a 'picture' of the data, followed by inferential procedures to determine the extent to which the research findings represent the sample. The qualitative data was analysed based on the identification of important themes and their relationships. This was followed by a detailed description of the transformed data (Hoffmann, 2005: 232) which formed the main discussion points at the data interpretation stage. A description of the analysis procedure followed by each of these methods is provided below.

### **4.6.1 Qualitative data analysis**

Ritchie and Spencer (2002) point out that a primary feature of the qualitative data analysis process is the sifting and sorting of data in order to detect categories. This requires the researcher to first write out the data as text and then familiarise himself with the most important issues and concepts. Through a recurrent process of reading and studying the transcript, the researcher was able to develop a depth understanding of the data (text) before starting to identify and construct the relevant themes or indexes. Some of the

themes were also informed by some important thoughts that were put forward by the respondents. The sifting and sorting of data into a thematic framework was particularly challenging because of the volume of data involved. Ritchie and Spencer describe the theme identification process as involving the:

*[...] making (of) judgements about meaning, about the relevance and importance of issues, and about (the) implicit connections between ideas...it also involves making sure that the original research questions are being fully addressed. (2002: 314).*

Once the themes were identified, they were applied routinely to the transcript based on a range of judgements regarding the meaning and relevance. As the relationships and patterns began to show up within the data, they were systematically matched against the others and those predicted prior to the field research. Causal inferences were made for each outcome where a predicted value is not negated for the same outcome by alternative “patterns of predicted values” (Yin, 2009).

#### **4.6.2 Quantitative Data Analysis**

As different types of quantitative scales (ordered, interval, and nominal) were used in the questionnaire to collect the data, different analysis techniques were used. The raw data was first scrutinised in order to eliminate errors and ambiguities; this involved cross-checking the data to identify missing values (Schneider, 2005). As the data were already assigned numerical values at the data collection phase, these were directly used to carry out different statistical operations. These included descriptive statistics such as means (represented through histograms, bar charts) and the computing of coefficients (cross tabulations) in order to test the significance and strength of associations and to show whether or not they conform with existing theories and knowledge. The different analysis approach was necessary because of the combined scales used in the questionnaire to collect the data.

#### **4.6.3 Software Packages**

Both the NVivo and SPSS software packages were used to support the data analysis process. The NVivo package was used mainly to code and categorise the textual data transcribed from the different qualitative methods used (see Appendix E). Much of the thinking and analysis was, however, done by the researcher since the software was merely

used as an analysis tool (Yin, 2009). A key output was the development of meaningful patterns to support the research process. On the other hand, the SPSS tool was used to analyse the quantitative data (see Appendix F). The initial stages of this process have already been discussed in section 4.6.2. This was directly followed by the data entry process which involved the direct typing of quantitative data into the SPSS Data Editor. Bryman and Cramer (2005: 21) observe that SPSS allows quantitative data to be scored and analysed by selecting the appropriate statistical technique from the range of techniques available. The skills to run these software programmes were acquired during one of the postgraduate training sessions organised by the University.

#### **4.6.4 Triangulation and data interpretation**

The triangulation process involved the mixing of both methods and data. This involved integrating all the data collected by the use of the different data collection techniques to bring out the main converging points which were used to validate claims. The use of both between (qualitative and quantitative) and within-method (structured interviews, focus groups etc.) techniques was particularly valuable in making assessments of the extent to which data from the various sources converged. Tobin and Begley (2004: 393) have shown that between methods triangulation reduces biases arising from the researcher, and the inadequacies associated with the use of a single research method. This triangulation approach was needed to cross-check the different perspectives about the current state of vulnerability of Freetown and the range of institutional issues that may enable or constrain the integration of climate change issues into urban planning decisions and processes. Yin (2009: 115) has noted that because triangulation draws from a variety of data sources, it is an important means of corroborating claims and validating research. It also enhances the reliability of research findings, since it allows data to be cross-verified from different sources. Berg (2007: 5) also asserts that because every research method reveals only a slightly different aspect of the same symbolic reality, the use of a combination of methods enables the researcher to acquire a better understanding of the substantive picture of that reality. The use of triangulation was therefore important in providing a more holistic and complete picture of the research findings.

## 4.7 Characterising Vulnerability

This work assesses the vulnerability of Freetown in order to identify the specific conditions that shape the city's susceptibility to climate change. The Composite Vulnerability Index (CVI) adopted by Turvey (2007) was adjusted to the needs of this research and applied to assess the vulnerability of Freetown. The CVI focuses on measuring the various components that collectively constitute the vulnerability of a place. In line with the IPCC, vulnerability is characterised in this research as comprising exposure to hazards, settlement sensitivity, and coping/adaptive capacity – as discussed in the conceptual framework. Other vulnerability components identified based on their assumed role in making some people more vulnerable than others (part of the structural causes) are the household's socio-demographic characteristics (Wongbusarakum and Loper, 2011; Hahn et al., 2009). Accordingly, these four dimensional components were selected from the researcher's theoretical understanding of the various concepts that underlie the vulnerability of a place. This was corroborated by a number of key professionals involved in urban planning, disaster management and climate change issues in Sierra Leone. Whilst it would have been possible to use a larger number of components, it was considered more practical to use only four, based on the researcher's observation that several socio-economic components are closely interlinked with high possibilities for one to represent many others. As each of the four components were found to have been variously used in similar studies (Hahn *et al.*, 2009; Nkem *et al.*, 2007; Turvey, 2007) related to climate change, it seemed reasonable to use them to convey the concept of vulnerability in this study, since they have already been tried and tested.

### 4.7.1 Purpose and focus of the assessment

The assessment focused on the people and places which need to be protected from the adverse effects of climate change. It is thus based on the current vulnerability of Freetown as determined by the prevailing socio-ecological conditions which drive climate change. Its purpose is to provide answers to such questions as: which are the most vulnerable settlements in Freetown, who is most vulnerable, and why? The basis for this questioning relates back to the epistemological position of this thesis, which holds that vulnerability differs widely among people and places. Viewed from this perspective, vulnerability is thus used throughout this assessment as a relative measure.

#### **4.7.2 The scale of assessment**

This work argues that assessing vulnerability at the local level is more appropriate for urban planning responses, as it provides planners and other policy makers with the kind of knowledge they require to make effective decisions about tackling climate change in cities. As the existing climate change literature shows, the assessment of vulnerability at the settlement level is not new. Aall and Norlan (2004, cited in Naess *et al.*, 2006) for example, used data from a variety of sources in a study in Norway to explore how vulnerability differs within the same municipal boundary. Hahn *et al.* (2009) similarly aggregated data using the composite index to show how two districts in Mozambique differ in their vulnerabilities to climate change. Therefore, with the recent rise in extreme climatic events, particularly in cities of the developing world, the need to investigate vulnerability at the local level offers great potential for planning processes to be more targeted and focused. While this work collects data on vulnerability based more on the use of household survey data, the scale of the assessment ranges from the household, through to settlements and up to the city level. In particular, the focus of this assessment at the settlement level is in view of the spatial differentiation of vulnerability and the context specificity of its occurrence. This does not however disregard the fact that activities at this level or at the overall level of the city are not being influenced by decisions or processes at the national level.

#### **4.7.3 How the indicators were developed**

The first stage of the indicator development process was the choice of the particular methodological approach to use. This involved making judgement to either use the inductive (data-based) approach which develops indicators from datasets using statistical significance as the basis, or to use the deductive (theory-based) approach in which indicators are developed based on theoretical insights drawn from the literature (see Chapter 2) and the conceptual framework (see Section 3.12). However, because vulnerability is undoubtedly a complex concept, a deductive approach was considered necessary, in part, because not all of its features are amenable to measure and, in part, because there was rarely any dataset on Freetown that reflects its key attributes. While several of the indicators used in climate change studies have generally focused on estimating vulnerability at the national level, some scholars (Damm, 2009; Naess *et al.*, 2006; Adger *et al.*, 2004) have shown that indicators can equally be used to assess a range

of vulnerabilities at the local level. This work draws mainly from the latter to assess vulnerability based on the use of local (locally-bounded factors that shape vulnerability) indicators. This is in response to the generally low predictive capacity of national climate scenarios at the local level (Naess et al., 2006) and the paucity of databases about settlement vulnerability in Sierra Leone. Nonetheless, the use of such local indicators in this research does not disregard the significance of climate scenarios in assessing the future vulnerability of Freetown.

**Table 2: Preliminary indicator list**

Vulnerability Component	Indicator	Source
Hazard Exposure	% houses in poor condition	Kazmierczak and Cavan (2011: 193); Dwyer et al (2004); Vincent (2004); Adger et al (2005); Jean-Baptiste et al (2010); Birkmann et al (2011)
	% area highly susceptible to flooding	
	% of people Injured during a disaster event	
	% of dwellings damaged during a disaster event	
	% of area susceptible to landslide	
	% of dwellings within proximity to hazard areas	
	% of people killed by climate-related disasters	
	% of dwellings affected by hazard event	
Socio-demographic Characteristics	Settlement location in unsafe area	Dwyer et al, (2004); Kazmierczak and Cavan (2011: 188); Peduzzi et al (2009); Vincent (2004); Birkmann et al (2011); Cutter et al, (2003); Wongbusarakum and Loper (2011)
	Age	
	% single person households	
	Employment	
	Gender	
	Illiteracy rate	
	Under-five-years-old mortality rate	
	% people 5-17 years old in the population	
	Marital status	
	Educational level	
	Occupation	
Settlement Sensitivity	Population under 15 and > 65	Adger et al (2005); Peduzzi et al (2009); Vincent (2004); Jean-Baptiste et al (2010); Kazmierczak and Cavan (2011: 188); Birkmann et al (2011); Wongbusarakum and Loper (2011)
	% lone parent households with dependent children	
	% of people with access to sanitation	
	% of people with access to clean water	
	Total dependency ratio	
	% of population within 5 kms of public transport	
	Construction material of walls of dwellings	
	Construction material of roofs of dwellings	
	Hazard experience	
% overcrowded homes		
Coping/Adaptive Capacity	Residence type	Cutter et al, (2003); Vincent (2004); Birkmann et al (2011); Dwyer et al., (2004); Kazmierczak and Cavan (2011: 188)
	% households who lost assets to hazards	
	Household income	
	Level of community Participation in decisions	
	Level of community organising	
	Level of awareness about climate change	
	Support from national/local level government(s)	
	Presence of local emergency response schemes	
	Membership to active CBO's	
	% household that cope with hazard events	
	% households with nowhere to relocate	
	Access to local/national emergency funds	
Level of awareness about disaster risks		
% household that received training to cope		
Presence of active NGO's		

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Having identified the key vulnerability components (Section 4.9) and the methodological approach, the second stage involved the preparation of a preliminary indicator list (see Table 2) prior to collecting the field data. The indicators were chosen from an extensive literature review on household's vulnerability analogous to their exposure, sensitivity, socio-demography, and coping and/or adaptive capacity. These were then adjusted based on their relevance to the local study area. For example, the indicator – % (percentage) of people injured during a disaster event (see Hazard Exposure, Table 2) was adjusted to % of people injured by climatic hazards (2007-2008) (see Hazard Exposure, Table 5). Once the list had been prepared, the indicators were sorted into their corresponding vulnerability components to match the broad theoretical concepts that had been used to define vulnerability. This list was then evaluated to select the final set of indicators based on a number of selection criteria. As discussed in Section 2.5, the main criteria used were relevance, accuracy, interpretability and accessibility of data (Nardo et al., 2005). The evaluation was based on expert judgement involving the use of ranks and symbols. The process involved assessing indicators against each of the selected criterion based on a scale similar to that used in Damm (2009). This is shown in Tables 3 and 4.

**Table 3: Criteria and ranking for selection of final indicators**

	<i>Very high</i>	<i>High</i>	<i>Middle</i>	<i>Low</i>	<i>Very low</i>
<b>Selection Criteria</b>	√√	√	√0	0	00

(Where 'very high' indicates an outstanding performance of indicator with regard to the particular selection criterion and, 'very low' representing a very poor performance)

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Table 4: Evaluation of potential indicators against the four selection criteria

	Indicator	Relevance	Accuracy	Interpretability	Data Accessibility
Hazard Exposure	% houses in poor condition	vv	vv	vO	v
	Large presence of muddy puddles/standing water	vv	vv	vv	vv
	Number of people Injured by climatic hazards (2007 – 2008)	vv	vv	vv	vv
	% of dwellings damaged during a disaster event	vv	v	vO	O
	% of area susceptible to landslide	vv	vv	vv	OO
	% of dwellings within proximity to hazard areas	vv	vv	O	VO
	% of people killed by climate-related disasters (2007 – 2008)	vv	vv	vv	vv
	Cracks and water-marks on walls and foundation of houses	vv	vv	vv	vv
	Area designated as unsafe for human settlement	vv	vv	vv	vv
Household's Socio-demographic Characteristics	Age	vv	vO	vv	VO
	% households with single female heads	vv	vv	vv	vv
	% households aged 18+ working in the informal sector	vv	vv	vv	vv
	Gender	vO	v	Ov	vv
	Illiteracy rate	vv	vv	vv	OO
	Under-five-years-old mortality rate	vv	vv	vv	OO
	% households aged 5+ not educated	vv	vv	vv	vv
	Marital status	vv	vO	vv	vv
	Educational level	vv	vO	vv	VO
	% households aged 18+ unemployed	vv	vv	vv	vv
	% households aged 60+	vv	vv	vv	vv
% household heads without a spouse	vv	vv	vv	vv	

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	Indicator	Relevance	Accuracy	Interpretability	Data availability
Settlement Sensitivity	% of people with access to sanitation	VV	VV	VV	VV
	% of people with access to clean water	VV	VV	VV	VV
	Total dependency ratio	V	VV	VO	VO
	% of population within 5 kms of public transport	OO	VO	VO	OO
	% dwellings with walls made of cement	VV	VV	VV	VV
	% dwellings roofed with zinc	VV	VV	VV	VV
	Hazard experience	VO	VO	OO	VO
	% overcrowded homes	VV	VV	VV	VV
	Settlement designated as planned with good road links	VV	VV	VV	VV
	% household heads who lost assets to hazards (2007 – 2008)	VV	VV	VV	VV
Coping/ Adaptive Capacity	Preparedness and capability of Local Government	V	V	VO	O
	% household heads who Participate in community decisions	VV	VV	VV	VV
	% households heads who belong to community organisations	VV	VV	VV	VV
	% household heads who are aware of climate change	VV	VV	VV	VV
	% household heads who receive outside support to cope	VV	VV	VV	VV
	Presence of local emergency response schemes	VV	VV	V	VO
	Membership to active CBO's	VV	V	VO	V
	% household who take actions to cope with climatic hazards	VV	VV	VV	VV
	% household heads with somewhere else to relocate	VV	VV	VV	VV
	% household heads with access to credit facilities	VV	VV	VV	VV
	% of household heads who aware of disaster risks	VV	VV	VV	VV
	% household that received training to cope with hazards	VV	VV	VV	VV
	Sense of community	VV	VO	O	OO
	Capacity for change	VV	VO	O	OO

Table 5 present a list of the indicators that met all the quality criteria set for this study. An explanation of the content of each of these indicators is also presented in Table 6. While not exhaustive in representing all the vulnerability attributes of households, these indicators were deemed reasonable in providing results that are more valid and germane in a local context.

**Table 5: Final indicator list**

<b>Vulnerability Component</b>	<b>Indicator/variable</b>
<b>Hazard Exposure</b>	% of people killed by climate-related disasters (2007 – 2008)
	Large presence of muddy puddles/standing water
	Cracks and water-marks on walls and foundation of houses
	Area designated as unsafe for human settlement
	% of people Injured by climatic hazards (2007 – 2008)
<b>Socio-demographic Characteristics</b>	% households aged 60+
	% households aged 5+ not educated
	% households aged 18+ working in the informal sector
	% households aged 18+ unemployed
	% households with single female heads
	% household heads without a spouse
<b>Settlement Sensitivity</b>	% of people with access to clean water
	% of people with access to sanitation
	Settlement designated as planned with good road links
	% dwellings roofed with zinc
	% dwellings with walls made of cement
	% overcrowded homes
	% household heads who lost assets to hazards (2007 – 2008)
<b>Coping/ Adaptive Capacity</b>	% household heads who Participate in community decisions
	% household who take actions to cope with climatic hazards
	% households heads who belong to community organisations
	% household heads who are aware of climate change
	% of household heads who aware of disaster risks
	% household heads with somewhere else to relocate
	% household heads with access to credit facilities
	% household that received training to cope with hazards
	% household heads who receive outside support to cope

This work could have selected indicators using data from government (national and local) or international database systems. However, because most of the data required for this work was either not available or was not disaggregated to the level of detail that was needed, household survey data was used. The methodology for collecting data using the

Table 6: An explanation of the content of final indicators

Component	Indicator/Variable	Description
Hazard Exposure	Large presence of muddy puddles/ Standing water	Indicates areas liable to flooding. It also indicates the location of dwellings in hazard-prone areas. This assessment was based more on value judgement taking 5% of ground area covered as the standard
	Number of people injured by climatic hazards (2007-2008)	Provides information on damage experienced from previous climatic disasters
	People killed by climate-related disasters (2007-2008)	Provides information on the human impact of weather-related events in the past
	Cracks and water marks on walls and foundation of houses	Indicates potential for damage by providing information about the effects on settlements and dwellings of past weather-related events. This assessment was also based on value judgement.
	Area designated as unsafe for human settlement	Provides information about areas recognised as at risk settlements. Determines probability for damage from severe weather events.
Household's Socio-demographic Characteristics	Aged 60+	It relates to the differences in the coping behaviour of households. Children and the elderly are considered to be more vulnerable
	Households with single female heads	Draws attention to the fact that households headed by females are more vulnerable owing to societal prejudice towards their gender
	Households aged 18+ working in the informal sector	Indicates whether or not households have a gainful and stable source of income
	Households aged 5+ not educated	Indicates the literacy level and is linked to access to information by households on how to cope with and adapt to climate change
	Households aged 18+ unemployed	Provides information on the level of employment of households. It gives an indication of the type of economic assets in the households
	Household heads without a spouse	Provides information on household's family composition including an awareness of households not having shared financial responsibility

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Component	Indicator/Variable	Description
<b>Settlement Sensitivity</b>	People with access to clean water	Provides information on the quality and type of water sources available to households and their individual levels of access to it
	People with access to sanitation	Gives an indication of the availability of sanitation facilities in the household
	Settlement designated as planned with good road link	Indicates the general condition of dwelling including whether or not settlement can easily be reached when there is a disaster event.
	Dwellings roofed with zinc	Indicates the condition of dwellings in the study area. It also provides information on the type of materials used in building construction. An important consideration here is an assessment of whether or not building materials can easily be afforded by households
	Dwellings with walls made of cement	
	Overcrowded homes	Indicates the size of households, the number of entitled rooms and the number of persons to a room
	Household heads who lost assets to hazards (2007-2008)	Indicates the experience of a previous disaster event. It provides information on the economic impact of the event on households
<b>Coping/Adaptation Capacity</b>	Household heads who participate in community decisions	Indicates whether or not there are available structures for households to make their voices heard and to also make their needs known
	Households who take action to cope with climatic hazards	Indicates the existence of capacity to address climate-related risks
	Household heads who belong to community organisations	Indicates the existence of social capital and the degree to which structures exist for mobilising community action
	Household heads who are aware of climate change	Indicates the level of consciousness of residents about the risks associated with climate change. Better risk awareness can have a major influence on household's adaptation capacity
	Household heads who are aware of disaster risks	
	Household heads with somewhere else to relocate	Indicates the degree to which immediate friends and family members are willing to help in the face of disasters
	Household heads with access to credit facilities	Indicates the ease with which households can have access to income in order to prepare, cope with or recover from climatic disasters
	Households that receive training to cope with hazards	Indicates the existence of capacity among households to cope
	Household heads who receive outside support to cope	Indicates the degree of relation with outside family members and whether structures (public or private) exist to provide support

household survey has been reported in Sections 4.4.3 and 4.5.2. At the risk of unnecessary repetition, 27 specifically designed questions corresponding to each of the final indicators formed part of the household survey. This was merged with qualitative data (interviews, focus group discussion and observations) to provide a better understanding about the condition of the study settlements. Priority in the selection of variables was given mainly to those processes at the settlement level which work either to weaken or aggravate vulnerability. The variables were then processed and analysed to allow the vulnerability of each settlement to be estimated.

Since the variables were measured using different units of measure, the third stage in developing the indicators was to normalise the data. Standardisation, whereby dataset for variables corresponding to each indicator are transformed into a ‘common scale’ and worked out within the range 0 (minimum) and 1 (maximum), was the preferred approach used. This was done on the basis of equal weighting. Prior to doing this, an inverse value (see Appendix G) was first taken for all indicators whose values were assumed to reduce vulnerability, similar to that described in Hahn *et al.*(2009). These relate to all the indicators of adaptive capacity, including the first five indicators (access to clean water, access to sanitation, planned settlement with good roads, and dwellings made of zinc roofed and cement walls) of settlement sensitivity. Taking the inverse of each of these indicators allowed higher values to be assigned to households with the least sensitivity or capacity to adapt. Standardisation of data (see Table 7) was necessary to ease understanding, given that different units of measurement were used for the datasets (Birkmann, 2006; Nardo et al., 2005). The formula used to achieve this was derived from Hahn (2009) and adjusted to the needs of this study as shown as follows:

$$X_{ij} = \frac{(Y_{ij}-Min_{yi})}{(Max_{yi}-Min_{yi})} \quad i = 1, 2, 3, 4; j = 1, 2, 3...27 \quad (\text{Equation 1})$$

(Where  $X_{ij}$  is the vulnerability component being assessed;  $Y_{ij}$  is the value of the  $i$ -th indicator/sub-component for community  $j$ ; and  $Max_{yi}$  and  $Min_{yi}$  refers to the maximum and minimum values of the  $i$ -th indicator for settlement  $j$ ).

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Table 7: Standardised values for individual indicators and vulnerability components according to study area

Vulnerability Component	Indicators/variables	Indicator Values			
		Aberdeen	Kingtom	Kroo Bay	East Brook
<b>Hazard (climatic) Exposure</b>	% of people killed by climate-related disasters (2007 – 2008)	0	0.5	1	0.75
	Large presence of muddy puddles/ standing water	0	0.13	1	0.97
	Cracks and water mark on walls and foundation of houses	0	0.29	0.96	1
	Area designated as unsafe for human settlement	0	0	1	1
	% of people injured by climatic hazards (2007 – 2008)	0	0.16	1	0.84
	<i>Total indicator values for Hazard Exposure according to study communities</i>	<b>0</b>	<b>1.08</b>	<b>4.96</b>	<b>4.56</b>
<b>Socio-Demographic Profile</b>	% households aged 60+	0.13	1	0.13	0
	% households aged 5+ not educated	0.71	0	1	0.29
	% households aged 18+ working in the informal sector	0	0.5	1	0.25
	% households aged 18+ unemployed	1	0.58	0	0.42
	% households with single female heads	0	0.54	1	0.08
	% household heads without a spouse	0	0.58	1	0.96
	<i>Total indicator values for Socio-demographic profile according to study communities</i>	<b>1.84</b>	<b>3.2</b>	<b>4.13</b>	<b>2</b>
<b>Settlement Sensitivity</b>	% households with access to clean water	0.38	1	0.25	0
	% households with access to sanitation	0	0.09	0.65	1
	Settlement designated as planned with accessible road links	0	0	1	1
	% dwellings roofed with zinc	0	0.67	0.33	1
	% dwellings with walls made of cement	0.04	0	1	0.22
	% overcrowded homes	0	0.14	1	0.71
	% household heads who lost assets to hazards (2007 & 2008)	0	0.69	0.42	1
	<i>Total indicator values for Settlement sensitivity according to study communities</i>	<b>0.42</b>	<b>2.59</b>	<b>4.65</b>	<b>4.93</b>
<b>Adaptive Capacity</b>	% household heads who participate in community decisions	0.83	0.11	0	1
	% households who take actions to cope with climatic hazards	1	0.1	0	0.2
	% household heads that belong to Community Organisations	0.57	0	0.14	1
	% household heads who are aware of climate change	0	1	0.09	0.07
	% household heads who are aware of disaster risks	0	0.5	0.5	1
	% household heads with somewhere else to relocate	0.13	0.05	0	1
	% household heads with access to credit facilities	1	0	0.13	0.65
	% household heads that received training to cope	1	0.05	0	0.46
	% household heads who receive outside support to cope	0	0.08	0.86	1
	<i>Total indicator values for Adaptive capacity according to study communities</i>	<b>4.53</b>	<b>1.89</b>	<b>1.72</b>	<b>6.38</b>

As the focus of this assessment was to develop an index of vulnerability for the different study settlements, the fourth stage involved weighting and aggregating the indicator values analogous to the four vulnerability components. This was to determine what contribution each component has made to the overall composite. The value for each of the vulnerability components was assessed by dividing the sum of the indicator values for that component by the overall number of indicators used. The formula used in doing this was adapted (again) from Hahn (2009) as follows:

$$X_{ijp} = \frac{\sum_{i=1}^n y_{iz}}{n} \quad (\text{Equation 2})$$

(Where  $X_{ijp}$  is the vulnerability component being assessed for settlement  $P$ ;  $y_{iz}$  is the value of the  $i$ -th indicator/subcomponent, indexed by  $z$  that makes up the component, and  $n$  is the total number of indicators).

The component index was used to rank settlements based specifically on how vulnerable they are with regard to that component. For example, component indexes were developed to rank settlements in terms of their relative exposure, sensitivity, adaptive capacity and socio-demographic characteristics. For each settlement, a Composite Vulnerability Index (CVI) (see table 9 of Section 5.6) was calculated in each case, by dividing the total values of the four components by the total number of indicators used. The formula used was adapted from Turvey (2007) as follows:

$$CVI_d = \frac{(CI1+CI2+CI3+CI4)}{n} \quad (\text{Equation 3})$$

(Where CVI is the composite vulnerability index for settlement  $d$ ,  $CI1...CI4$  represent each of the four vulnerability components and  $n$  is the total number of indicators).

Since the CVI provides a standardised measure to characterise climate change vulnerability in the study area, it provided an understanding of the diversity between settlements in terms of their different vulnerability levels and the reasons for such differences. The last stage (visualisation) therefore, was to communicate this information (Chapter 5) as clearly as possible “without obscuring individual data points” (Nardo et al., 2005: 28). As shown in Table 10, this involved a further disaggregation of the information into a set of categories in ways that clearly reflect the existing state of vulnerability of settlements.

Vulnerability could have been assessed for each settlement in relation to the four dominant climate hazards faced by households (flooding, landslide, extreme rainfall and extreme heat). However, because the damage caused was observed to be very similar for the different hazards (e.g. flooding, extreme rainfall, landslide), with parallel responses also being taken by households to address these, it was considered sensible to focus on the vulnerability of 'place' instead, since this provides a better indication of whether or not a place is susceptible to climate change. Arguably, focusing on the vulnerability factor (e.g. location in a flood plain, poor drainage systems) rather than the hazard 'itself' makes planning processes more proactive because they provide detailed understanding as to why certain areas are more vulnerable than others. Pearce (2000: 158) has in fact argued that, for planning processes, knowledge about the likelihood of a disaster event is far more important than information about its attributes (e.g. type, magnitude).

#### **4.8 Reflection on the Research Methodology**

An important aspect of this work lies in the attempt to 'stand outside' and reflect on the way the data collection process was carried out, including a discussion of how this process might have affected the research findings. In particular, it is seen as an important means of providing personal insights into how the data collection process was decided, from the time of making decisions on 'who' to access information from, up to the stage of deciding on 'how' (Mauthner *et al.*, 2002: 56) and 'what'. Having to make these decisions before going out into the field was the most challenging element, since it seemed to assume that those individuals and organisations which were identified for inclusion were already willing to give their consent. In spite of the difficulties, it was in practice possible in all cases to negotiate access based on the participant's voluntary and informed consent. Participants were briefed on the purpose of the research, the type of information required from them, and the potential risks of taking part in the research. Assurances were however given that the information obtained from them would be used only for this research and that their individual identities would be treated in confidence, since the researcher's only interest is in the aggregate form of the data. The purpose of doing this was to establish confidence in the research process by eliminating suspicions and fears.

With regard to the documentary reviews, one key problem faced was the extreme difficulty in obtaining copies of the relevant laws and policies on planning. While Planners

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frequently referred to these laws during the interview sessions, most of the documents were either reported missing or not provided to the researcher. Some of the documents relating to the FCC were reportedly lost to arson in 1997 (during the war) with only a few that were partially saved. In the case of the MLCP&E, the documents were lost either to disintegration, rats, misplacement or through being misappropriated. Even with the accessible documents, the printed text in some was either faded or entirely wiped out. This was partly because of their age (since several of these documents date back to the colonial period and the poor quality of the ink used. In trying to get to grips with the relevant details (Chapter 8) therefore, about six months of precious time was devoted to an internet search, in order to put the relevant pieces together. As a result of the paucity of data on planning laws in Sierra Leone, this was definitely not a straightforward task. The amount of time devoted to putting these details together was without a doubt phenomenal. Moreover, because this research involved the use of the direct observation technique, it was important to obtain information on people without their knowledge. Care was however taken at all times not to cause them or their milieu any discomfort and embarrassment. It is concluded, however, that the threat of potential bias did not affect the analysis and conclusions that were reached because of the safeguards built into the research process.

## Chapter Five

### The Climate Change Concerns for Freetown

#### 5.1 Introduction

This chapter addresses the first research question of this study: what are the key climate change concerns for the development of Freetown? It begins with a brief discussion of how climate change has been problematised in Sierra Leone including an examination of the current and future changes in climate, before describing the physical characteristics of the embedded cases selected for investigation by this study. With regards to the current climate variations and change which influences people's vulnerability to hazard, the chapter uses the Composite Vulnerability Index (CVI) to provide an understanding of how vulnerability differs between individuals and places in Freetown. Specific attention is given to the factors which underlie the vulnerability of places and how these are likely to shape the effects of climate change. The chapter also identifies the potential climate change impacts for Freetown based on existing vulnerabilities and the likely changes in climatic conditions. The GHG emission sources for Freetown are also identified, including a discussion on how these emissions are currently addressed. In effect, this chapter addresses the research question by providing answers to the following sub-questions:

- (i) How is climate change structured as a problem in Sierra Leone and what future climatic conditions will Freetown experience due to climate change?
- (ii) How are settlements and households vulnerable to climate change in Freetown and why?
- (iii) How will climate change affect Freetown?
- (iv) What are the main GHG emission sources in Freetown and how are they addressed?

#### 5.2 The Evolution of Climate Change in Sierra Leone

*“The Government of Sierra Leone is committed to the principles of environmental protection, particularly climate change and biodiversity. The government's commitment can be measured from the number of international environmental protocols it has signed. This is in addition to the submission of*

*the country's Initial National Communication (INC) which was started in February 2003 with funding from the GEF/UNDP". (Interview with CA-CCPI, 2009)*

The above statement epitomises the state of awareness and the responses by (national) government to the challenges associated with climate change. In Sierra Leone, the emergence of climate change issues is closely linked to the evolution of environmental management, which was inspired in the country by the 1972 United Nations (UN) Conference in Stockholm. Although the main thrust concerned environmental protection, as climate change was not yet perceived as a problem in the country, little attention was accorded to it (the environment). It was only after the launch of the Brundtland Report (of 1987) that environmental concerns started gaining prominence in the country. The government demonstrated its commitment to the report by introducing a range of policies and strategies which sought to limit and reduce the irresponsible use of the environment, including its natural resources. This was initiated through the development of environmental plans, which were mainly prompted by such international organisations as the United Nations Development Programme (UNDP) and the World Bank. After the 'Earth Summit' in Rio de Janeiro (1992), the government intensified its efforts by preparing additional policies and action plans relating to several other aspects of the environment. This was aimed at reducing both the negative environmental impacts of man and to improve the conditions of human settlements. The National Environmental Action Plan (NEAP), which represents one of the earliest of such plans, specifically highlighted the need to promote and coordinate environmental management in addition to increasing awareness about its significance. This was supported by other national commitments by the country including the ratification of the Kyoto Protocol (1992) and the United Nations Convention to Combat Desertification (UNCCD) (1994). Because several of these plans and policies were prepared in isolation to other national development policies and plans, the extent of success in their implementation has been generally questionable. With the ratification of the UNFCCC in 2006, however, Sierra Leone seemed set to commence activities on climate change.

### **5.2.1 The framing of climate change**

Even before Sierra Leone ratified the UNFCCC in 2006, awareness about climate change in the country had already been on the increase. Climate change, however, took the centre

stage in political discourses as a result of the occurrence of such events as the Indian Ocean Tsunami of 2004 and Hurricane Katrina (in 2005). The leading influence in the framing of such discourses was the mass media which consists of a variety of local newspapers and international TV channels. Most of the media discourses at this time focused mainly on representing climate change as a global problem which countries needed to address. Initial portrayals of emissions reduction as the main response strategy favoured the UNFCCC's mitigation policy goals which the Global Environmental Facility (GEF) sought to promote through the UNDP. This was reflected in Sierra Leone's First National Communication to the UNFCCC which focused more on mitigation issues rather than on dealing with the local vulnerability of settlements which climate change is likely to exacerbate. By structuring vulnerability mainly in sectoral terms, this study ignored the local level where climate change impacts are likely to be felt. These same representations, even though marginally modified by policy and political actors, have been largely maintained in the way climate change has been constructed as a problem. This way of framing it has not only influenced the way the public perceive their exposure to climate change risk, but also their attitudes and behaviour in taking responsibility to address potential impacts.

### **5.2.2 The influencing role of the UNFCCC/GEF and the UNDP**

In 2006, the responsibility for climate change was entrusted directly to the Environment Division of the then Ministry of Lands, Housing and the Environment. This was because of its mandate over all land use planning and environmental matters. Long before this responsibility was assigned, the government had already started working on the country's Initial National Communication (INC) study (Pratt, 2007). This was necessary because political discourses relating to climate change in Sierra Leone were already well advanced. The study, which was commenced in 2003, focused primarily on assessing the country's GHG emission status along with the potential for mitigation. At the heart of this study was the dominant representation of mitigation issues which the GEF always advanced through the UNDP. This portrayal was bound to take priority, because as the main sponsor of climate change issues in Sierra Leone, the GEF (acting through the UNDP) had enormous influence in ensuring that national climate change strategies meet international (in this case, the UNFCCC) policy requirements. The GEF/UNDP framing was effectively advanced by politicians, as well as other actors including central government ministries

and agencies, such as the university. Because it is these same actors (who are largely middle class) that form the readership and audience of newspapers (local and international), discussion on climate change seems to have converged around them. This lack of space for the views of the less privileged in climate change discourse indicates the unequal power relations in the country with regard to the framing and portrayal of climate change issues. It further suggests disregard for the local vulnerabilities of settlements, shown in the lack of permeability of the prevailing climate change discourse to local-level representations. Thus, even though presented as an institutional<sup>5</sup> and technical capacity building strategy, this study, which was completed in 2006, merely supported Sierra Leone to accomplish its obligatory role with the UNFCCC. It did not therefore focus on assessing the locally-specific vulnerabilities of the country, in spite of the overwhelming need to do so.

Vulnerability and adaptation issues were only legitimised in the political agenda in Sierra Leone when the UNFCCC, in pursuance of decision 28 of the 7<sup>th</sup> Conference of Parties (28/CP.7), requested Sierra Leone to submit a National Adaptation Programme of Action (NAPA). The entry of vulnerability and adaptation into political discourse was stepped up by the identifiable link between the extreme precipitations that were recorded in several parts of the country and the rise in the occurrence of floods and landslides. An important aspect of media representations at this time was the increased insistence on immediate political action by the government. However, even though a range of actions have been initiated to institutionalise climate change at the level of central government, up to 2009 when this field research was carried out, no such arrangement was observed at the local level. The low level of response actions at this level reflect the dominant views that earlier characterised the framing of climate change. This is the view that climate change is a global problem which national governments need to address by limiting their GHG emission levels.

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<sup>5</sup> In the foreword to the report, the then Vice-President of Sierra Leone indicated that “*With the preparation of this report Sierra Leone will be in position to establish an Institution responsible for climate change activities locally and internationally (Pratt, 2007)*”.

### **5.2.3 National activities to address climate change**

Consistent with the dominant discourses, responses (formal) to climate change in Sierra Leone have been focused mainly at the national level of government. The first phase of national efforts regarding climate change involved a series of institutional reforms by the government which led to the establishment of a Climate Change Secretariat (CCS) and a Technical Committee on Climate Change (TCCC). This committee, which is very similar to the National Environmental Protection Board, had overarching responsibility for environmental management. As the membership of this board was drawn from higher-ranking officials from various environment-related line-ministries and agencies, it was arguably well-placed to develop a shared strategy that will deal with the destructive effects of climate change. However, because budgetary allocations specifically related to climate change are rarely made by the government, this Board which now oversees the SLEPA has always relied on the UNDP/GEF for support. This over-reliance by the government on the UNDP/GEF has tended to discourage locally-initiated actions, since the various country activities so far undertaken have been carefully tailored to meet the GEF/UNDP funding requirement.

The second phase has involved a range of activities by the government with the sole aim of fulfilling Sierra Leone's obligation to the UNFCCC. In 2006 for example, the government completed its Initial National Communication (INC) to the UNFCCC which highlighted the state of GHG emissions by the country and the likely impacts of climate change on some specific sectors. In particular, the report emphasized the importance of increasing awareness about climate change and the need to develop adequate capacity to increase understanding about its impact. Also emphasised was the need to facilitate coordination among the various line ministries and agencies that will eventually have responsibilities for tackling the impacts of the change. Other prepared national documents relate to the National Adaptation Plan of Action, cataloguing the various adaptation activities mapped out for the key government sectors considered to be affected by climate change. Even though designed to meet international requirements, an important aspect of all these plans is the highlighting of the country's acute capacity constraints as well as the level of support that it requires to effectively address the expected impacts. A major shortcoming however is that these documents only briefly refer directly to the country's national development plans (Vision 2025, PRSP – Agenda for change, MDGs), by cross-referencing some of the prioritised climate change activities. The Second National Communication is currently on-

going as part of Sierra Leone's obligation under the UNFCCC, following which, the mainstreaming process is expected to commence. As Dodman (2011:121) and Mukheibir and Ziervogel (2007: 145) note, the major challenge is that nearly all of the actions that have been undertaken so far are nationally focused and do not provide adequate knowledge about the differing realities at the local level where vulnerability is highest. The next subsection will now examine the future climate changes that will occur in Freetown, starting with a description of the current climate.

### **5.3 The Present Climate Situation of Freetown**

In common with many other parts of Sierra Leone, Freetown experiences high temperatures, heavy precipitation and high humidity, which might be summarised as a wet tropical climate. Its location along the western foothills of the Peninsula Mountain exposes it to the orographic effect of the mountain range, which causes very heavy rains during the rainy season. The two main seasons that Freetown experiences are the dry season which begins from November to April and the wet or rainy season which lasts from May to October. Although much of the rain that occurs here is convectional, the climate itself is strongly influenced by the West African Monsoon. This wind system which blows from across the Atlantic Ocean produces very heavy rainfall (3,000mm per annum) throughout the country. In Freetown and some other parts of the Western Area, mean annual rainfall may range from 3,000mm to 6,700mm with more elevated settlements nearer to the sea having far higher rainfall (Hayward and Clarke, 1996). Although the rains fall consistently throughout the wet season, they are heaviest in the months of July and August, when the mean monthly rainfall total reaches its maximum (27 days). As a result of these heavy rains, the high temperatures and the maritime influences, humidity in Freetown is also generally high and may reach up to 93% throughout the country during the rainy season, even though it declines progressively to between 70 and 80% for the remaining months. In areas further inland, humidity may fall by as much as 47% as rainfall decreases.

The dry season, on the other hand, is associated with the north-east trade winds (Harmattan winds) which blow from across the Sahara desert. Although mean temperatures in Sierra Leone generally range between 21° and 32°C, temperatures up to 36°C (especially in March) and as low as 20°C were recently (2008) observed in some parts of the country. McSweeney *et al.* (2008) similarly observed in a recent study using climate data at the

national scale that, between 1960 and 2003, mean annual temperature in Sierra Leone has increased by 0.8°C. The study specifically pointed out that within this same period, the frequency of ‘hot’ nights has risen significantly at an average of 38 nights per year. The work could not, however, determine the daily temperature trends for the country due to the unavailability of data. Nevertheless, it was pointed out that since the 1960s, the mean annual rainfall in Sierra Leone has been on a steady decline, although it was not able to determine whether or not “this is part of a long term trend”.

### **5.3.1 Projections of future changes in climate for Freetown**

Apart from the Initial National Communication report to the UNFCCC and the UNDP’s climate change country profile, not much progress has been made on developing climate change projections for future years in Sierra Leone. Moreover, even the future projections of the two reports focus only on the changes that will occur at the national level. This ignores the local level (including Freetown) where climate change impacts are likely to be more severe. This lack of projections at the local level is attributed largely to the insufficiency in many areas of the place-specific climate data that would enable climate change modelling. The high uncertainties produced by downscaling Global Circulation Model (GCM) output for the country to the high spatial resolutions needed to make assessments at the local level (Pratt, 2007), also exacerbate this problem. Nonetheless, it has been possible to infer future climate changes for Freetown from two sets of projections that were reviewed by this study. The first relates to global predictions made by the IPCC, including sub-regional predictions that have been reported in a number of publications about West Africa. The use of projections at this level is important because it places the overall analysis within an international context. The second draws mainly from the ‘broad’ future predictions made about the Sierra Leone climate by the UNDP, a study which was carried out by McSweeney *et al.* (2008). This thesis maintains that while there may be other projections made by authors outside of this frame, the reports examined here are considered to be most appropriate. This is because they specifically relate to the future climatic conditions that Freetown will face.

### **5.3.2 Future climate changes based on global and sub-regional projections**

The IPCC (2007) predicts that globally, the earth will warm by about 0.2°C per decade in the next two decades and that a further warming of about 0.1°C per decade will be expected even if the emission of all GHG's were reduced down to 2000 levels. It further predicts that worldwide, surface temperature will rise by 1.8°C and 4.0°C by the end of the 21<sup>st</sup> century. Of particular note is that warming in the whole of Africa and across all seasons is predicted to be potentially much greater than the annual mean warming projected for the globe. Alongside this warming will be increases in global sea levels which are estimated to continue to rise into succeeding centuries even if GHG's were to be stabilised today. Alo and Wang (2010: 914-915) similarly project that the entire West African region will be affected by future warming due to elevated atmospheric CO<sub>2</sub>. Surface air temperatures are predicted to increase by 2.5% (in June, July and August) and by 2.9% (in December, January and February) along the Guinea Coast where Sierra Leone is located. Because of the active vegetation feedbacks within this region, however, the June, July and August temperatures will decrease thereby causing an increase in the warming of the December, January and February temperatures by 3%. The work further predicts decreased rainfall in June, July and August (JJA) for all coastal locations within this same area. The decreased rainfall will result partly from the weakening of the south westerly winds caused by this radiative effect (elevated CO<sub>2</sub>) and, in part, by the amount of moisture generated in the local area. It will potentially cause a decrease in the amount of surface runoff that will be experienced and a fall of about 10% in soil moisture. The projected increases in rainfall during December, January and February not only, however, implicate the amount of rainfall that will be experienced but its intensity as well. In Freetown, this will probably accelerate higher surface runoff. Runoff will also be reinforced by the city's hilly topography, along with the range of land surface processes at work.

### **5.3.3 Future climate change based on national projections**

McSweeney *et al.* (2008) similarly project that by the 2060s, the mean annual temperature of Sierra Leone will rise by between 1.0-2.6°C, and will further increase by 1.5-4.6°C by the 2090s. Compared to the inland areas, the warming effect that will result from this rise will however be much lower in Freetown and in the other coastal settlements.

Nevertheless, the number of hot days everywhere will increase by 26-63% by the 2060s and by 37–84% by the 2090s. The frequency of hot days and hot nights is projected to be much greater in the coastal regions than inland. Thus all projections indicate that the number of hot days and nights that can be expected as a result of climate change is much greater than is currently experienced. The study further projects that in spite of the noticeable variations in the level of precipitation that will be experienced, precipitation levels will be generally high country-wide. Rainfall trends are projected to change, with heavy rains occurring not only in July, August and September, but also in October, November and December. Sea level is also projected to rise “by between 0.13 and 0.56 by the 2090s” relative to the 1980-1999 sea levels. These changes in climate will probably affect Sierra Leone’s vegetation, which is projected to change significantly by 2100. From tropical rain forest, 60% of the vegetation will change to tropical dry forest, so that 24% of the landmass will be covered by tropical dry forest; while 12% of the landmass will host subtropical moist forest. This is primarily due to the projected decrease in rainfall along with the temperature increases that are predicted to take place (Pratt, 2007). The report estimates in particular that if sea levels were to rise up to 1m based on current climate, an approximate coastal population of 2,315,860, including all those living in the low-lying settlements of Freetown, would be at risk. Sea level rise will also lead to the loss of an estimated 26.4 km<sup>2</sup> area of coastal land.

#### **5.3.4 Summary**

The analysis has shown that until the early 2000s, climate change in Sierra Leone was not seen as a significant issue, but has only recently emerged from the evolving discourses about the environment. It shows further that long before this time, the main focus in the management of the environment was environmental protection, since climate change was not, up to this point, defined as a problem in Sierra Leone. Environmental protection was inspired in the country by both the Brundtland report (1987) and the Rio de Janeiro ‘Earth Summit’ (1992). These two documents set into motion legislation for a series of environmental policies and plans relating to a range of environmental problems. However, the increased awareness about climate change in the early 2000s was due largely to media representations and the devastation in the wake of the Indian Ocean Tsunami (2004) and Hurricane Katrina (2005). This stepped up political consciousness in the country, leading to the eventual recognition of the issue of climate change.

It has additionally been shown that because the UNFCCC/GEF, through the UNDP, have always been the key pioneers of the country's response strategy, their representations of climate change seem to have taken precedence. This is exemplified by the way the country's response strategy has been structured in apparent favour of mitigation issues over adaptation considerations. This is illustrated in the various country assessment reports in addition to the predominance of climate change response actions at the national level, thereby ignoring the local levels where vulnerabilities abound. Moreover, the construction of vulnerability in mainly sectoral terms has led to a neglect of the more critical realities at the local level where climate change impacts are likely to be extreme. The lack of emphasis within this frame of the linkages between vulnerability and hazard risks and of the need for people to adapt has led to a culture of apathy, with very few coping systems demonstrated at the local level. Climate change responses are therefore limited to the national level where in addition to setting up a management framework, a series of national reports about climate change have been undertaken.

#### **5.4 Assessing the Vulnerability of Freetown**

This section analysis the vulnerability of Freetown by focusing on the four embedded cases selected for this study. The assessment approach used here is based on the recognition that even though hazard-risk dominates climate change research, it is not the only source of vulnerability in cities. As socio-ecological systems, cities are centres where humans and the environment interact. This interlocking existence between human and natural systems implies that in addition to their biophysical attributes, a social dimension has to be considered in order to provide a broadened understanding of the risks that exist and of the way climate change is likely to affect human and ecological systems. An important element of this analysis is the potential to provide an understanding of the 'local effects' of climate change through the provision of locally relevant information for use at the scale of the city. Consistent with Dolan and Walker (2003), vulnerability is viewed here as a 'starting point' whereby the vulnerability of Freetown is seen as conditioned not only by climatic hazards but by a range of other processes and stressors. Prior to taking this discussion forward, a detailed description of the study area will first be presented as well as a discussion of the reasons for their choice. This will be followed by an

investigation of the key locational attributes of settlements which underlie the differentiated vulnerability faced by humans and their settlements.

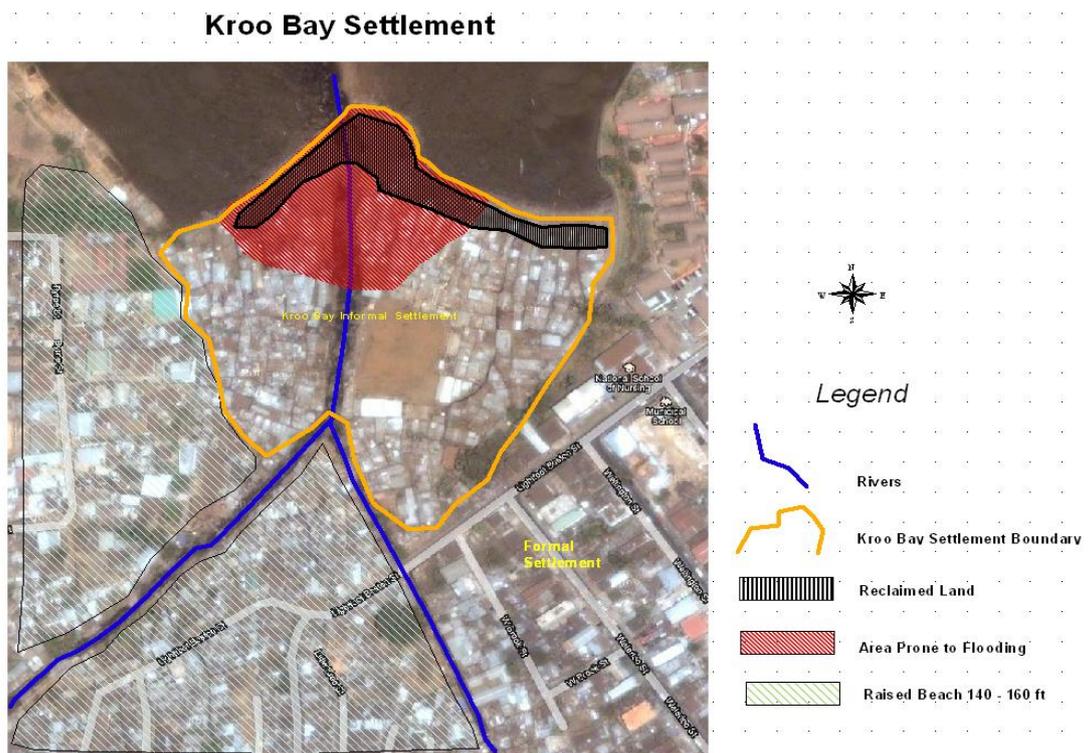
#### **5.4.1 Case study area selection**

As discussed in Section 1.8, Sierra Leone's capital, Freetown was selected as a case for this study. Yet, the enquiry focused on four embedded cases (in Freetown) which were selected (see Figure 4) from among eight cases which initially formed the sampling frame. The rationale for the use of the embedded cases was to enable the investigator to examine the scale and spread of vulnerability in Freetown in more detail. Nonetheless, the focus of the analysis was on the 'larger' case (Freetown), since it can provide a more holistic understanding of the study phenomena (Yin, 2009). Prior to constructing the sample frame, a consultation session between the researcher and some senior officials of the Planning Ministry was undertaken, in order to seek clarification about how settlements in Freetown are classified as formal or informal. This was followed by a reconnaissance trip through the city to gather additional information about the specific location of settlements in terms of whether they are coastal, hilly or low-lying. The eight settlements that formed the sampling frame were selected using the purposive sampling technique, since the investigator already knew something about the cases which he wanted to use in testing theory. Four criteria were used in the selection and screening of the cases. These criteria were settlement type, place of location, and cost in terms of time and transport. The cases were divided into two equal sets (four each) based on whether or not they are classified as formal. The names were then folded separately and placed into a box, from which two were randomly selected from each set (settlement type) using the lottery procedure. A study of this kind could have used more than four cases but given the time and resource constraints, it was not possible to explore a large number of cases. Nevertheless, the four that were selected are considered both adequate and critical in testing the propositions of the research (De Vaus, 2001).

#### **5.4.2 Case One: Kroo Bay**

Kroo Bay is the largest and one of the oldest slum settlements in Freetown with a population of about 15, 000. It is historically classified as among the earliest existing areas of central Freetown that have had lower socio-economic progress (Doherty, 1985)

compared to many other parts of the city. This settlement has developed at the confluence of two major streams (see Figure 5) which rise from the Freetown Peninsula and empty into the Atlantic Ocean. Much of this settlement is inhabited by the urban poor, who usually dwell in shacks close to the sea. With altitudes generally below 50ft above sea level, Kroo Bay is highly susceptible to sea level rise. The settlement is characteristic of the many areas of Freetown that have developed chaotically, with huge environmental sanitation problems. As a result of the generally poor drainage and infrastructure systems in the city, Kroo Bay has experienced some of the worst flooding incidents in the last two decades. The spate of unplanned development that characterises this settlement, along with its unsafe location in a flood plain, makes it highly vulnerable to the effects of climate change.

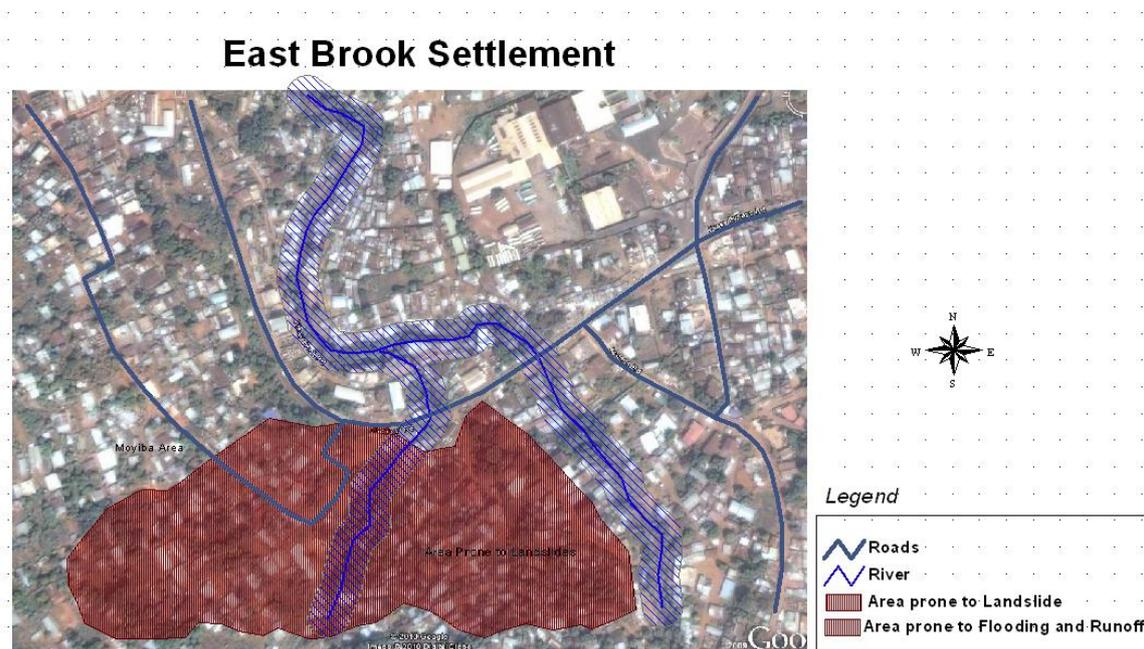


**Figure 5: The Kroo Bay settlement** (Source: Google) Earth

### 5.4.3 Case Two: East Brook

Located in Eastern Freetown (figure 6), East Brook was originally a small settlement that existed long before Sierra Leone gained its independence. It has developed from a poor and undersized neighbourhood to span the entire region from the foothills of the Freetown

peninsula in the area immediately below the Kortright ridge, to the whole area covering the steep and sharply descending slopes which terminate at the Granville Brook. The settlement has grown considerably since the 1970s owing to the continued population pressures on the city. In the last five years, the number of houses within this settlement has more than doubled. The intensification of floods and landslides in this settlement in recent years reflects the general state of vulnerability of this area. Over the years, heavy run-off has increased the occurrence of rock fall, in addition to the tendency for landslides that now forms the main threat to this settlement.



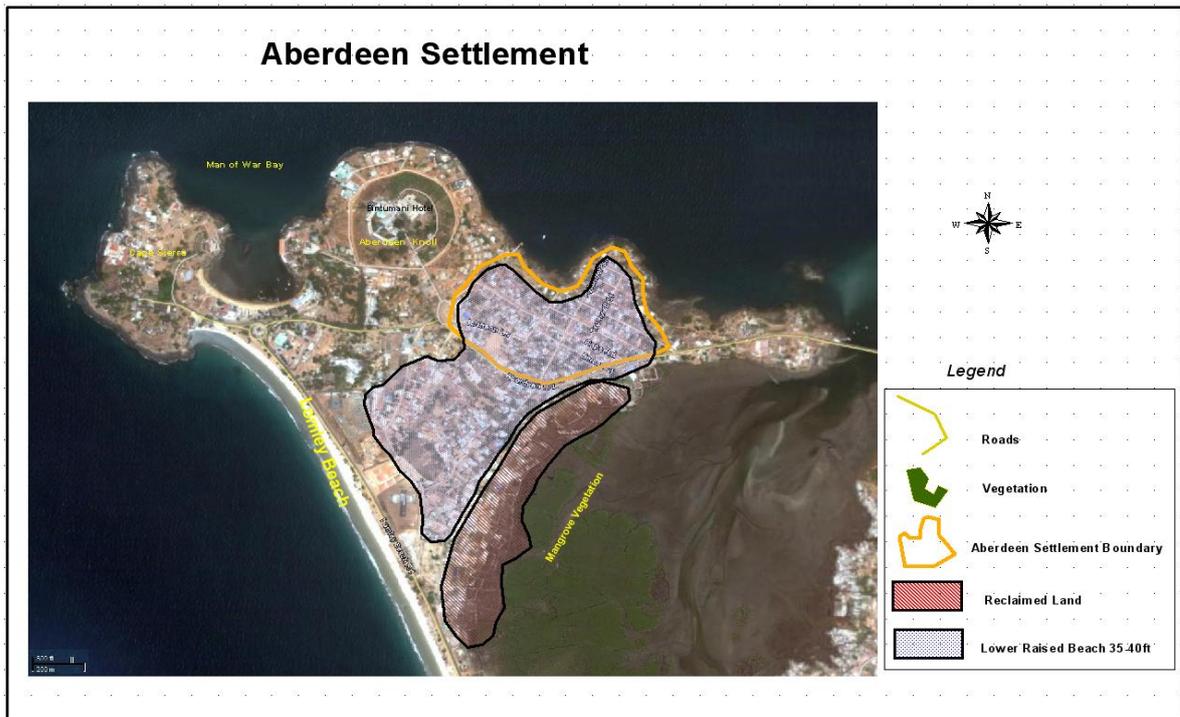
**Figure 6: The East Brook settlement**

(Source: Google Earth)

#### 5.4.4 Case Three: Aberdeen

Aberdeen is a generally low-lying settlement that is almost separated from the main Freetown landmass by a tidal creek. The settlement (Figure 7) is typically characterised by raised beach terrain running along the coast, which forms one of the city's renowned natural beaches. Much of Aberdeen was originally covered by mangroves but this has been largely cleared for housing development. Aberdeen is home to most of the city's hotels and tourist attraction points. It has developed as one of the few well-planned and affluent neighbourhoods in Freetown. Yet over the years, several illegal developments have

occurred especially along the shallow shorelines of the creek and the Atlantic. Although no extreme weather-related hazard has been reported in this community, its low altitude, poor drainage and weak infrastructure renders several areas and developments at risk from flooding associated with sea level rise.



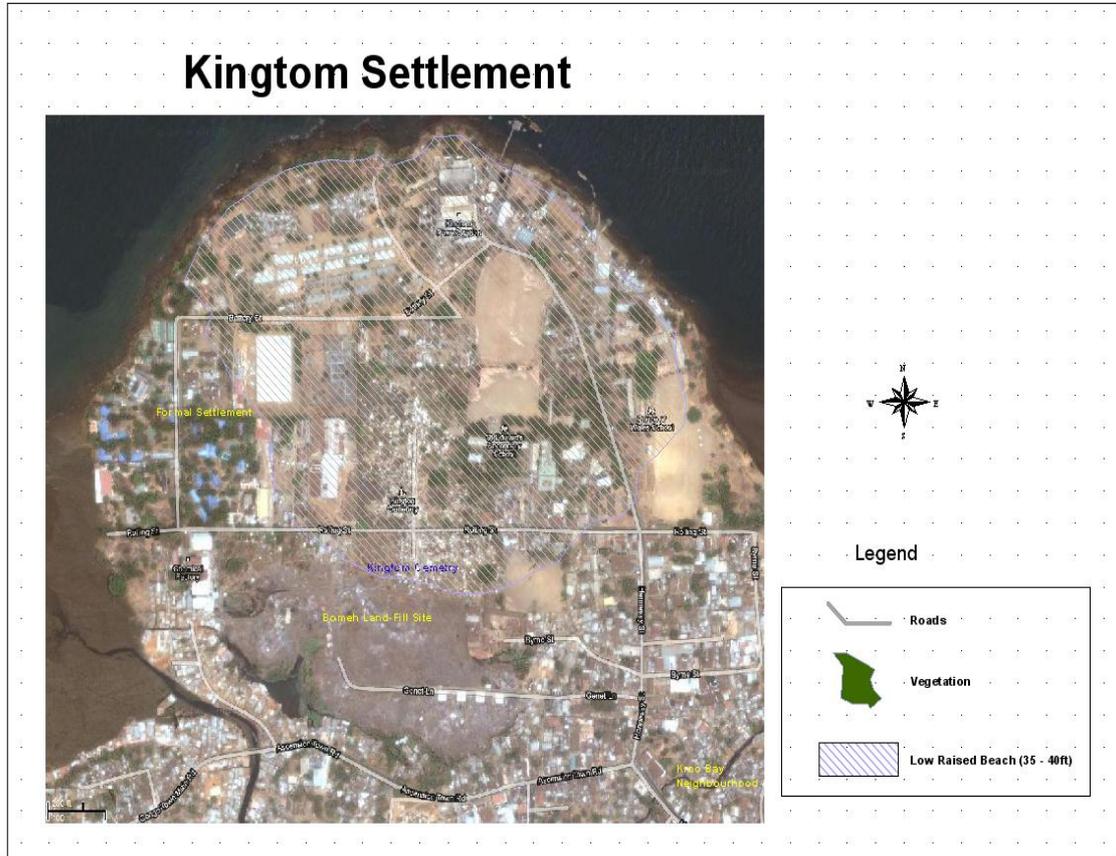
**Figure 7: The Aberdeen settlement**

(Source: Google Earth)

#### 5.4.5 Case Four: Kingtom

Kingtom (Figure 8) is less hazard-prone, even though its shoreline is being severely eroded by the sea due to tidal effects. It is generally well-planned with an average altitude of about 150 ft above sea level. The settlement is home to Freetown’s main power supply source (the Kingtom Power Station) including a number of factories and warehouses. It also host one of the two main dumpsites in Freetown (the Kingtom Dumpsite) where solid wastes (mainly domestic refuse and market refuse) are disposed. This dumpsite was originally designed as a controlled dump but the huge size of wastes that it now receives seem to have overwhelmed the capacity of management (at local and national levels) thereby making the site both dangerously unstable and an environmental and human health risk. Since most of the shoreline also lacks any seafront protection, Kingtom is especially at risk

to the effects associated with sea level rise, in spite of its current safety from any major weather-related hazard



**Figure 8: The Kingtom settlement**

(Source: Google Earth)

Having examined the main locational attributes which distinguishes the four study settlements, the next sub-section will now present a discussion on how these attributes and a range of other factors influence the current and differentiated vulnerabilities of individuals and their settlements. More specifically, the prevalence of hazard events in Freetown is first examined in order to analyse people's perceptions of them. This is followed by a description and analysis of the current vulnerability of the study area based on an assessment of the four embedded cases. The factors which shape vulnerability with specific regard to hazard exposure and the capacity of individuals to cope will then be analysed. This work could have assessed the future vulnerability of Freetown under alternative scenarios, in addition to identifying the different pathways to dealing with

potential impacts. However, because of time and resource constraints, such analysis was not possible. Notwithstanding the uncertainties associated with the assessment of climate change, the output of the CVI could arguably provide planners with the information required to make analytically sound judgements about the way urban settlements should be planned in the face of climate change.

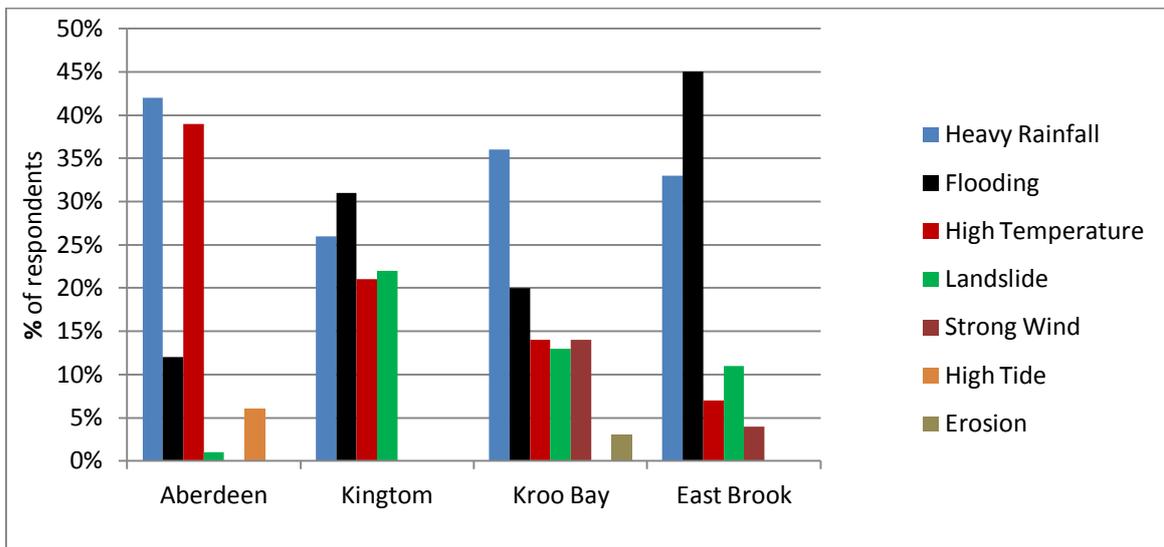
## 5.5 Hazard Prevalence in the Case Study Areas

*“It’s not easy here during the rains. The entire city gets flooded. Of course, Kroo Bay is no secret but you also have other illegal settlements where the situation is now much worse. There, you find children always having malaria, pneumonia, diarrhoea – it’s either one form of sickness or the other. In the dry season, the malaria gets a lot worse owing to the proliferation of stagnant waters.” (Interview with SL-NGO3, 2009)*

The above statement by one NGO worker interviewed for this study represents the existing state of vulnerability of many areas of Freetown to the threats posed by climate change. Owing largely to its climate and topography, Freetown is fraught with numerous environmental problems that are impacting upon the conditions of its human settlement. The city experiences a range of climatic hazards every year and the frequency and intensity of damage that they cause is now fast increasing. A significant feature of these hazards is the influence of the marked changes in the pattern and intensity of precipitation and temperature that have been widely observed. Even though not habitually recognised as hazardous, these changes which influence floods, heat waves and other climatic events strongly affect the health and well-being of the city’s population. Thus, in line with McLeman and Smith (2006:220), it is the approach of this thesis to consider such occurrences (heavy rainfall and high temperatures) as hazards, owing to the propensity of their material effects to increase harm or cause damage to the various at-risk elements. In particular the IPCC’s (2007) observation is highlighted that in addition to sea-level rise, changing temperatures and precipitation will pose the greatest threat to human systems and the world’s natural resource base in low-income cities. Regarding data presentation, various values will be used in this chapter to help examine vulnerability to climate change.

### 5.5.1 Hazards that households are concerned about

The identification of hazards which households are concerned about was based primarily on a survey of residents' perceptions. Figure 9 shows the different climatic hazards that households are concerned about in the four communities surveyed.



**Figure 9: Types of hazard households are concerned about**

Source: Field work (2009)

The results show that although several climate-related hazards occur in Freetown every year, households are most concerned about only four hazard types. Their concern was based on the frequency of occurrence of the hazard as well as its intensity. We can clearly see that the way each of these four main hazards (flooding, heavy rainfall, landslide and high temperature) is experienced differs markedly between the study areas. Thus, while flooding and heavy rainfall seem to be the dominant concern in East Brook (45% and 33%), Kroo Bay (20% and 36%), and Kingtom (31% and 26%), high temperature and heavy rainfall (39% and 42%) seem to be the main hazard concern at Aberdeen. Additionally, landslide is more of a concern at Kingtom (22%) while concerns for the less-frequent hazards (strong wind, high tide, and erosion) were reported by less than one-tenth of the respondents, and arose in only one or two communities. Although the differences in the nature and scale of these hazards are commonly attributed to the degree of exposure of settlements (as determined by their topographic characteristics), it is arguably the local

socio-economic and institutional conditions of places that determine whether or not people are affected by the impacts (Simon and Fragkias, 2008: 11; Kelly and Adger, 2000:323).

### 5.5.2 Which hazards are households most concerned about and why?

To explore the above question, from the list of hazards, respondents were asked to pick out and place in rank order, the ones that they are most concerned about. The responses provided a useable ranking of the hazards to reflect households' concerns (Table 8).

**Table 8: Hazard ranking by households according to the study communities**

	<b>Aberdeen (n = 50)</b>		<b>Kingtom (n = 50)</b>		<b>Kroo Bay (n = 50)</b>		<b>East Brook (n = 50)</b>	
<b>Flooding</b>			<b>61.4%</b>	1 <sup>st</sup>	<b>69.2%</b>	1 <sup>st</sup>	<b>68.1%</b>	1 <sup>st</sup>
<b>Landslide</b>							31.9%	2 <sup>nd</sup>
<b>Heavy rainfall</b>	26.9%	2 <sup>nd</sup>	38.6%	2 <sup>nd</sup>	30.8%	2 <sup>nd</sup>		
<b>High temperature</b>	<b>73.1%</b>	1 <sup>st</sup>						

Source: Field work (2009)

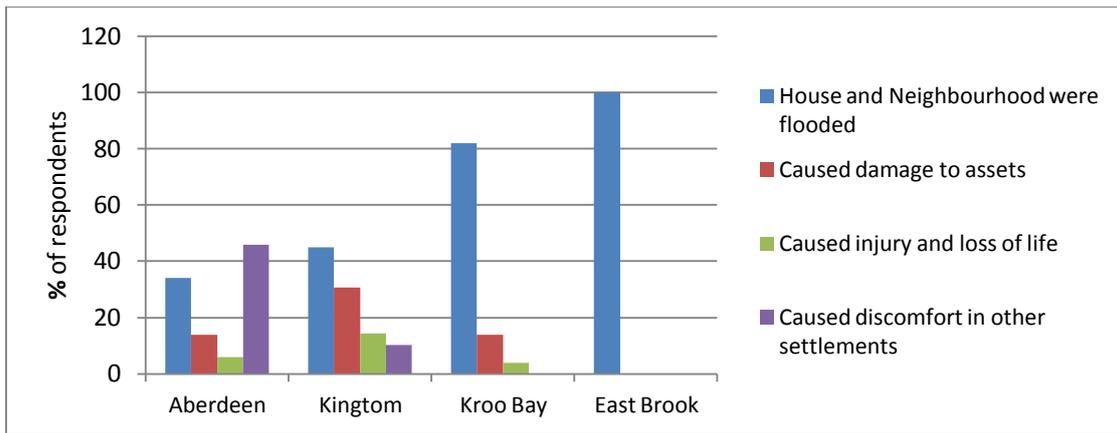
As Table 8 shows, in spite of the earlier identification of heavy rainfall as the hazard that households in all the study communities are concerned about, it is flooding that is of most concern since it represents the highest ranking for three (Kingtom, Kroo Bay and East Brook) of the four study areas. High temperature, which achieved the highest ranking at Aberdeen (73.1%), is another major hazard concern, but because unease about it was found to be limited only to one study settlement, further investigations were made about this issue at the Meteorological office. This enquiry showed that while temperature is observed to have increased nearly everywhere in Freetown, settlements that are more disaster-prone (e.g. Kroo Bay) are more likely to be concerned about hazards that can easily cause damage to human life and property. This implies that because high temperature is yet to cause any reported death, it is not seen by many people as a major threat. Whilst landslide does not represent the foremost concern of respondents, it is an important source of anxiety to the hill slope settlement of East Brook (31.9%) where it has

become an almost yearly event. In August 2009, for example, just one landslide event at East Brook led to the destruction of several houses with seven deaths and 15 injuries reported (Reuters, August 2009). Although landslides do also take place in such planned settlements as Kingtom, the occurrence is limited mainly to the coastline areas where coastal erosion from tidal waves is very active. The occurrence of landslides around these coastal fringes intensifies the hazard-exposure of several of the irregular dwellings that have sprouted within this area.

As was earlier highlighted, flooding is a major concern to communities in Freetown because of the observed frequency and intensification of its occurrence whenever there is heavy rain. One respondent I interviewed during a group discussion at East Brook for instance, expressed as follows:

*“We are suffering in this place. It is important that this flooding is controlled. We have lost many things to it and who knows what will happen next.” (FG4-EBK, participant 2, 2009)*

Flooding due to heavy rainfall is exacerbated by the haphazard ways in which most settlements have evolved, with rarely any consideration for land use planning. The high cost of land in more stable locations in the inner city has caused the proliferation of informal settlements with developments being concentrated along hill slopes, coastal fringes and reclaimed lands along the coast. This unrealistic cost for land, which is the consequence of the poorly regulated and enforced land and property markets in Sierra Leone, has been identified by Wamsler (2004: 16-18) as one of the key institutional forces that account for most of the vulnerabilities faced in cities. As the occurrence of flooding and landslide increases, the predominance of these informal settlements in very unsafe locations in the city will potentially increase the risks that thousands of populations will have to face from climate change. Owing to the range and level of anxiety that exists, the respondents were further asked to provide reasons for their concern about hazards, the results of which are presented in Figure 10.



**Figure 10: Reasons for household concern about hazards**

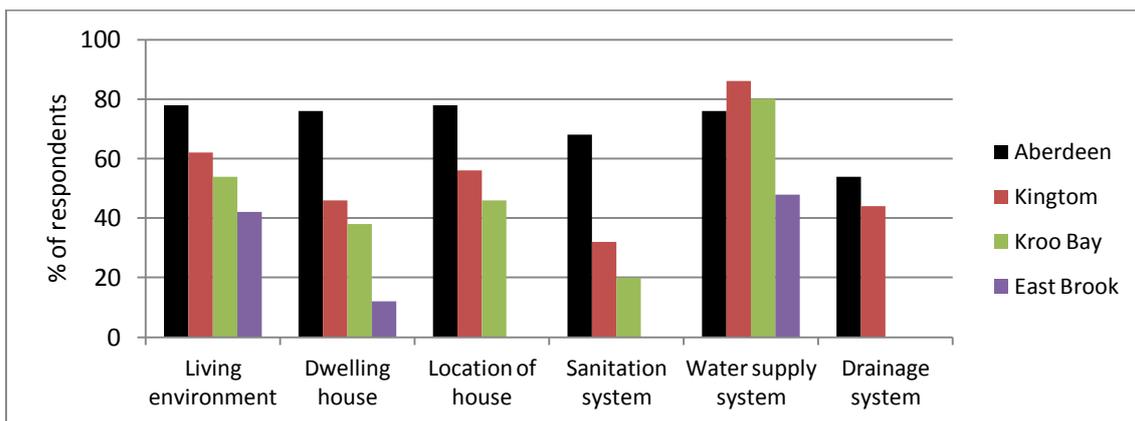
Source: Field work (2009)

The responses show that apart from East Brook, the unease which households express about hazards is attributed to a variety of reasons. Most of these reasons were observed to be directly linked to the individual household's previous experience with hazards. This was demonstrated by one respondent in a group discussion at Kroo Bay as follows:

*"The intensity with which flooding occurs here has now made us all very nervous. During the rains, we have to be always ready (to cope with, fight or retreat) as it is difficult to foretell when next it will take place. The worst moment is when it happens at night. Then, you can rarely decide what is appropriate to do. It has been a very difficult time for us. You can't have a sound sleep when you have all these things to worry about."*(FG3-KRB, respondent 3, 2009)

As Figure 10 shows, while communities generally differ in terms of the reasons for the state of unease among households, it is the flooding of houses and of the immediate neighbourhoods that is the foremost concern. East Brook (100%) and Kroo Bay (82%) which torrents of water flow through whenever there is heavy rainfall are unsurprisingly the two areas where these views are widely expressed. The predominance of flooding in these two settlements is in part a result of the instability of their locations in addition to their appalling drainage and infrastructural systems. Satterthwaite *et al* (2009:17) and Pelling (2003: 15-17) have identified this differential provision of services within settlements as a manifestation of the unequal power relations between different classes of people within cities. Because these differential provisions are the forces which shape the adaptive capacity of places, they therefore underlie the vulnerability of a place.

Although households in Aberdeen and Kingtom (Figure 10) share similar concerns, we can see that they differ widely in the ways their reasons are prioritised. For example, while both communities are concerned about the discomfort that hazards cause to other settlements, it is in Aberdeen (46%) that this view is more widely observed. It might be conjectured from the different responses that households in the four study communities are unequally exposed to hazard risks. This is because whereas the Kroo Bay and East Brook (informal settlements) residents are mostly concerned about the damages that occur directly in their communities, some residents of Aberdeen and to a lesser extent, in Kingtom (the formal settlements) are more concerned about the occurrence of hazards in other communities. The implications of the differential exposure to hazard risks are arguably more important to the informal settlements since it is in these very areas where massive disruptions have always occurred to human livelihoods. This argument notwithstanding, there is still much to be learned about the way respondents think about the respective communities in which they live. Thus, questions were asked using six attributes to assess respondents' satisfaction with their communities of residence. These include the existing housing condition, the living environment, the drainage system, the water supply system, the place of housing location within the settlement, along with the sanitation system.



**Figure 11: Respondent's satisfaction with community of settlement**

Source: Field work (2009)

## Chapter 5

From Figure 11, we can see that respondents from Aberdeen are the most satisfied with their settlement because they show the highest level of satisfaction with nearly all the attributes assessed. On the other hand, respondents from East Brook are the least satisfied, as they showed little satisfaction with any of the attributes and none with some. In addition, whereas the Kingtom and Kroo Bay respondents showed satisfaction with both their living environments (62% and 54%) and water supply system (86% and 80%), it was only Kingtom that showed further satisfaction with the location of house (56%). This therefore suggests that even though Kingtom residents are not satisfied with the three remaining attributes (housing condition, drainage system, and the sanitation conditions), they demonstrate far greater overall satisfaction with their settlement than those living at Kroo Bay or East Brook. As a result of this, it seems reasonable to assume better living conditions in the formal settlements. This, arguably, makes their lives and properties better secured from hazards than those living in the informal settlements. As this chapter is interested in identifying the contextual conditions that influence the vulnerability of settlements to climatic hazards, we examined for each attribute and in each case, for selected locations, to test whether or not resident's satisfaction is related to whether or not the settlement is formal or informal.

The analysis shows that as regards satisfaction with the condition of the dwelling house, the correlations are significant for Aberdeen and the two informal settlements of Kroo Bay (chi-square with one degree of freedom = 16.234,  $p < 0.001$ ) and East Brook (chi-square with one degree of freedom = 4.006,  $p < 0.045$ ). Nevertheless, they are less significant for Kingtom and Kroo Bay (chi-square with one degree of freedom = 1.033,  $p > 0.309$ ). Thus, even though the latter may suggest a condition of 'no relationship', it can be assumed from the earlier tests that there is a strong association between settlement type and satisfaction with housing condition (that is, whether or not you are satisfied with the condition of your dwelling house depends largely on whether or not you live in a formal or informal settlement). The fact that the latter test shows a 'no relationship' condition suggests that there can be other factors that make housing conditions in the two settlements far less distinct. These relate in part to the slum-like settlement that has sprouted and is fast expanding around the main Kingtom landfill site and along the coast. It can also be attributed to the slow progress in the rehabilitation of some buildings of the main Kingtom Police Barracks which, even though severely damaged during the civil war (1991 – 2002), are still largely unrepaired.

In the same way, resident's satisfaction was examined with regard to two of the other attributes that is, condition of living environment, and the water supply system. It was observed also that except for Kingtom and Kroo Bay (condition of living environment: chi-square with one degree of freedom = 0.657,  $p > 0.418$ ; water supply system: chi-square with one degree of freedom = 0.638,  $p > 0.424$ ), there was a significant relationship between settlement type and the satisfaction of residents. While the condition of 'no relationship' that was observed in the test between Kingtom and Kroo Bay can partly be explained with reference to the earlier reasons, it was observed that the water supply system at Kroo Bay has been improved in the last two years. In spite of this, the general living conditions at Kroo Bay are still far from improved. Thus, it has been shown that for all the attributes, the satisfaction of residents depends on the type of settlement (formal or informal) that they live in. This finding is in direct concurrence with households' perception about hazards, since it is in the informal settlements where the facilities provided are inadequate that such concerns were strongly expressed.

### 5.5.3 Hazard risks at the city level

Similar to the findings at the household and community level, the study revealed that the occurrence of hazards at the city scale is directly linked with the city's climate pattern, the socio-economic conditions as well as the form of its topography. Freetown's tropical climate produces very heavy (seasonal) rains of up to 6,700mm from May to October each year, with high temperatures ranging from 19°C to 32°C. This, together with its hilly topography; the sharp descent of the Peninsula Mountain towards the low-lying coastal area; the water that gushes down the hill slope into residential areas; the muddy soils that it carries; along with the poor, undersized, and often, clogged drains owing to the dumping of wastes; causes widespread flooding across the city with implications for landslide. The extent of damage resulting from such events in many parts of the city has made several communities very uncomfortable about the heavy rains they experience. One community leader from Kroo Bay for instance observed that:

*"these days, when we hear about the rainy season, everybody becomes very uneasy because then, you begin to expect certain things to happen like floods, landslides, mudslides, the collapse of buildings...these things have become like some annual events for us especially in the rainy season; and the bad thing is that they become worse and worse as the years go by."(FG3-KRB, respondent 1, 2009)*

## Chapter 5

The observed intensification of flooding and landslides is particularly attributed to the over-saturation of soils whenever there is torrential rain. In 2009 for example, two major flooding events due to torrential rains occurred, that affected nearly the whole of the Freetown settlement, leaving over 1,000 people homeless, and destroying several homes and properties (Tam-Baryoh, 2009). A gruesome landslide in September 2010 due to a heavy downpour around the Mountain Cut area (Central Freetown) also caused the destruction of several houses with 14 deaths reported (mostly, from the same family). As a result, many city authorities are now strongly concerned about the recent increases in disasters, and at the fact that their occurrence is now more widespread in Freetown. One local government official for instance, explained that:

*“at a time, everyone thought that things like landslide or flooding will only affect such areas as coastal settlements you know, but (I tell you that) in recent years, we have seen that whenever it rains it’s like the whole city floods - everywhere is affected and the trouble is...the level of poverty in the country...is what has exacerbated this issue to a large extent.”(FT-OLG2, 2009)*

Indeed as a post-conflict city, Freetown does not have any significant infrastructural development in place to safeguard its growing population from hazards owing largely to the lack of resources. Decades of under-investment in urban services and infrastructure and the poor planning systems that prevailed have led not only to the proliferation of informal settlements that are rarely serviced, but also to the irregular growth of most of the planned settlements in the city. This irregular growth may have also been produced by institutional norms relating to the city’s tenure systems, as well as the inadequate regulatory structures which both determine access to land and the kinds of development that are allowed. Many of these settlements have therefore occurred either along such unsafe areas as hill slopes, gorges, flood plains and coastal fringes, or along drainage ways thus obstructing rain-water flows. As most of these hazard-prone areas are dominated by low-income groups who can hardly afford to invest in their personal safety, any increase in the incidents of hazard is likely to heighten the susceptibility of various places to the impacts of climate change. This will be reinforced by poverty because already, the city does not have the requisite resources to protect itself even from the current hazards faced. An interesting finding, however, was that in spite of the frequency in the occurrence of these hazards, there is so far no comprehensive study in Freetown about the exact number of people or settlements that are exposed to them.

## *Chapter 5*

However as Figure 12 shows, it was possible to conjecture from the recent disasters that a large part of the unplanned hill-side settlements especially in Eastern and Central Freetown and the many unprotected coastal slums that have evolved over the decades are the most vulnerable areas of Freetown. To provide evidence of the level of vulnerability of Freetown, the four settlements selected for this study underwent assessment in this regard. While not sufficient in themselves, these cases will provide an indication of the specific characteristics of places that makes them particularly vulnerable to the adverse effects of climate change.

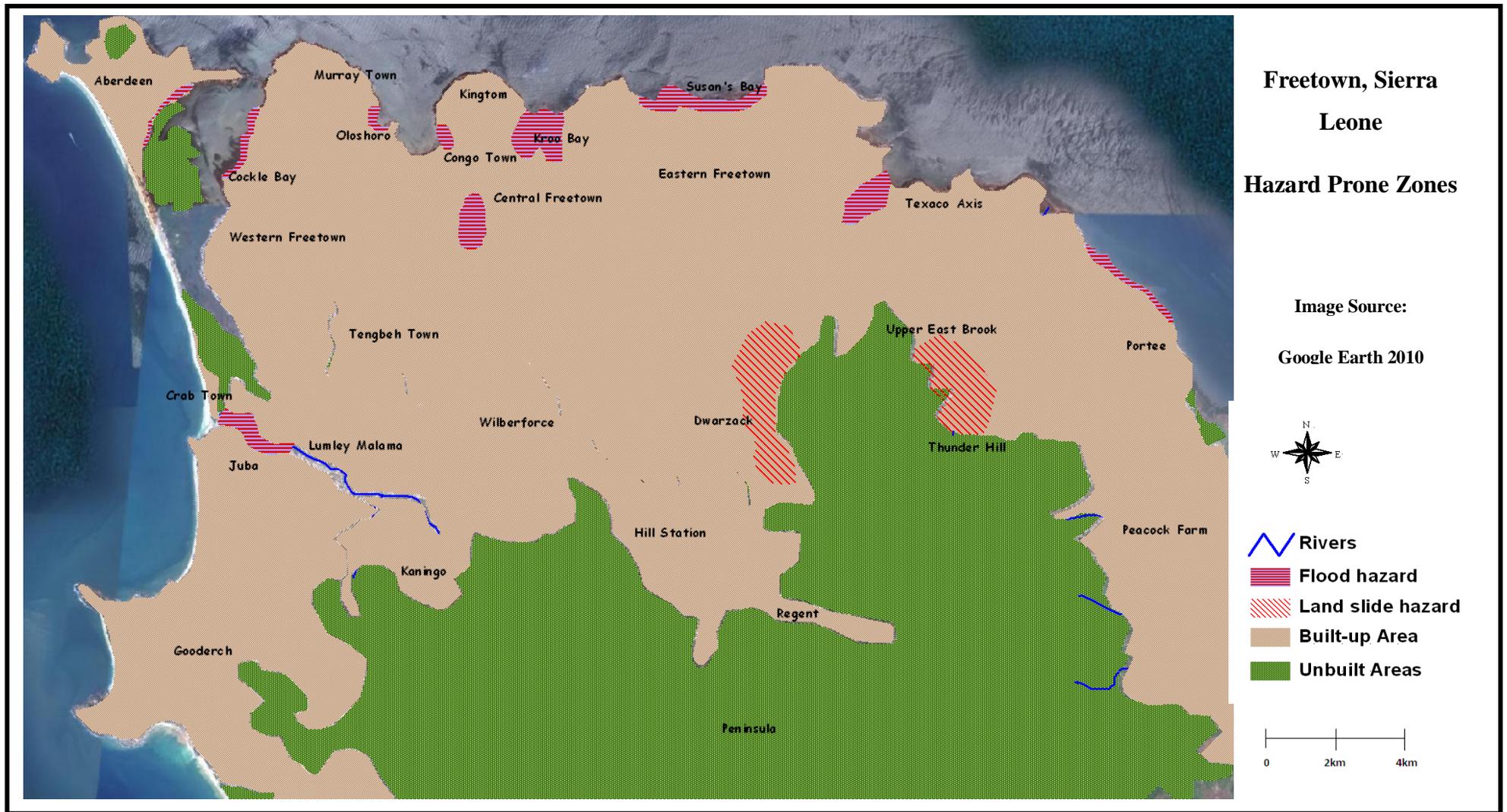


Figure 12: Hazard mapping of the Freetown settlement

## 5.6 Does the Setting Matter? A Vulnerability Analysis of the Study Area

Table 7 of Section 4.9 presented the main vulnerability components and the respective indicators (or sub-components) used to assess the vulnerability of Freetown. A discussion of how these indicator and component values were each derived has also been presented in that Section. As the discussion shows, the CVI which this study uses to assess the vulnerability of the four study cases has been developed based on the use of both the indicator and the component values. From the results shown in Tables 7, 9 and 10 it can be seen that there is a remarkable difference between the four settlements in terms of their relative vulnerability to climate change. This sub-section will now analyse each settlement, and based on the CVI, the distinguishing attributes that make up its current vulnerability to climate change impacts.

**Table 9: The Composite Vulnerability Index (CVI) for the study area**

	Exposure	Socio-demography	Settlement Sensitivity	Adaptive capacity	Vulnerability Index
<b>Aberdeen</b>	0	0.07	0.01	0.17	0.25
<b>Kingtom</b>	0.04	0.12	0.09	0.07	0.32
<b>Kroo Bay</b>	0.18	0.15	0.17	0.06	0.57
<b>East Brook</b>	0.17	0.07	0.18	0.23	0.66

**Table 10: Scale for measuring the CVI**

0.76 – 1.00	Extreme vulnerability
0.51 – 0.75	High vulnerability
0.26 – 0.50	Moderate vulnerability
0.01 – 0.25	Low vulnerability
0.00	Invulnerability

### 5.6.1 East Brook

As Tables 9 and 10 show, East Brook (0.66) is the most vulnerable of all the four study settlements, with a vulnerability status rated as ‘high’. Vulnerability in East Brook is high

because it has the highest component indexes for both adaptive capacity (0.23) and settlement sensitivity (0.18), in addition to being the second most exposed area to climatic hazards (0.17). As has been variously emphasised, one reason for the high exposure of East Brook to hazard events is its unsafe location. East Brook has developed over the years on a steep mountain slope owing to the increased population pressures on Freetown. The limited land space in the city, the high land prices along with the poor planning systems have forced the settlement to develop as an overcrowded, irregular settlement consisting mostly of poor and low-income groups. Its emergence from the unauthorised occupation of state lands implies that nearly all the shelters have been built without regard to any building codes or planning rules. It is also ranked among the most deprived communities in Freetown, despite current attempts by government (though informally) to legalise its existence.

Poor infrastructural investment by government in this area is the major reason for the appalling state of the drainage systems, increasing its exposure. Apart from its virtual lack of essential urban services, East Brook ranks among the many communities in Freetown that are not connected with road networks. Its hilly topography, unplanned development, and the lack of ‘empty’ lands arguably make it a low priority area for road and services extension. Thus, as Reid and Satterthwaite (2007) and Parnell *et al.* (2007: 358-359) have argued, a poor drainage system, infrastructural deficit, an inadequate settlement planning system, along with the appalling general conditions, have coalesced to produce the high level of vulnerability that exists. Regarding the living conditions in this settlement, a group leader at one of the focus group sessions voiced her displeasure as follows:

*“The problem here is huge. There are no roads, no water taps, no proper toilets, and no drainage facilities. It’s not just a case of residents always trying to improve conditions in this settlement, the government needs to do something.” (FT-CBO4, 2009)*

This statement supports an earlier finding in this chapter (Section 5.5.2) which showed a significant difference between East Brook (the least vulnerable settlement) and Aberdeen in terms of the way residents feel about their housing conditions, the living environment, and the water supply systems. In line with Romero-Lankao and Dodman (2011:116) and Kelly and Adger (2000: 326-329), these differential living conditions between the Freetown settlements reflects the huge disparity in people’s entitlement to resources, as exemplified by the high and differentiated levels of poverty in the city.

From Table 7 (of Section 4.9), it can also be seen that the key signals of hazard exposure in East Brook are the recurrent damage that afflicts dwellings, as shown by the many cracks on houses (1) and the number of deaths (0.75) that occur from both floods and landslides. Residents here have found themselves increasingly exposed by the rise in the intensity of rainfall and the inadequate infrastructure and drainage. In August 2009, for example, just one landslide in this settlement led to the destruction of several houses, with seven deaths and 15 injuries reported (Reuters, 2009). This incident confirms the observation of Reid and Sattethwaite (2007) and Parnell *et al.* (2007: 358-359) that vulnerability in informal settlements can be high because many have developed in very unstable locations which put the lives of thousands of people at risk from extreme events.

With regard to settlement sensitivity, it is shown that East Brook has the highest concentration of dwellings with no corrugated roofs (1), in spite of the high incidence of heavy rains. Although these dwellings are, in reality, a lot fewer than those with corrugated roofs, their existence demonstrates the level of inequalities that exist among low income groups, with some residents not being able to buy better housing materials. Some of the dwellings in this settlement have been haphazardly developed without much consideration for preserving drainage channels, given the torrents of water that flow through, or for the provision of toilet facilities (1). Its unplanned development (1), the limited land space, and the high demand that exists for vacant land, have meant that plot sizes are generally very small, and most households live in crowded conditions with far more than three persons per room (0.71). Although East Brook is less vulnerable in terms of the socio-demography (0.07) of the study population, it does, however, concentrate a high proportion of single-parent households (0.96). Compared with dual-parent families, such households are most at risk of poverty owing to their limited income.

Additionally to its high vulnerability, East Brook has the least adaptive capacity. This is due largely to the low awareness of residents about disaster risks (1) and, their low levels of participation in community decisions (1). Most residents here (predominantly non-Freetown natives) do not also have somewhere else to relocate (1) even where disaster threats are clearly evident. Although some household heads have lost their relatives and assets to disasters, outside support from the central government, NGO's and the FCC is very minimal (1). Nevertheless, the residents of East Brook are fairly aware about climate change (0.07).

### 5.6.2 Kroo Bay

Tables 9 and 10 show that Kroo Bay has the second highest vulnerability index (0.57), with a vulnerability status classified as high. Kroo Bay is vulnerable in part because it has the highest component values for hazard exposure (0.18) and socio-demographic profile (0.15). Although Kroo Bay ranks as the second-most sensitive of the four settlements to climate change (0.14), it however has the highest capacity to adapt (0.06<sup>6</sup>). As Table 7 (Section 4.9) shows, the exposure of Kroo Bay is due both to its unsafe location in a flood plain (1) and to the predominance of poor drainage systems as demonstrated by the large presence of muddy puddles and standing water (1). Kroo Bay has developed particularly at a confluence where two of the city's major streams (the Alligator River and the Sanders Brook which are usually liable to flood) converge. Its low elevation causes flood waters that flow downstream from up the hills to occasionally merge with tidal rises along the coast thereby engulfing most of the settlement. This is aggravated by the poor settlement planning, the absence of an effective infrastructural protection system (see Figure 13), the poor drainage systems and the acute shortage of urban services.



**Figure 13: A side-view of the Kroo Bay settlement**

Source: Field work (2009)

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<sup>6</sup> Adaptation capacity was inversely calculated since the activities involved here were assumed to reduce vulnerability. This same approach was used for assessing five of the indicators used for settlement sensitivity (with the exception of the last two indicators as shown in Table 7. Thus, unlike the first two vulnerability components, the lower indices here signify either much higher capacity to adapt or higher sensitivity of the settlement to climate change impacts.

Apart from the huge quantities of solid waste that are brought down into this settlement, the residents have endured recurring inundations of human effluent that are washed down in the flood waters. These waste accumulations have long been a serious health hazard, especially for residents in the newly-reclaimed areas where waterlogging is now more regular. Most respondents consider these events and the frequent and severe flooding occurrences as evidence of their high levels of vulnerability. The poor drainage system has in particular caused more recent (i.e. in the last two years of this research) damage at Kroo Bay with the residents reporting the most hazard-related deaths (1). The prevalence of floods in this settlement are attributed to years of under-investment by government in the city's road, sewage, and drainage infrastructure. These have caused much of the inundation and waste from upslope and in the inner city to regularly gush down through inappropriate drainage channels into the Kroo Bay settlement, where it accumulates before entering the sea.

Kroo Bay is particularly sensitive to climate change because of the uncontrolled way in which the settlement has developed. Uncontrolled development is pervasive because apart from the huge shortage of vacant lands, planning activities in Freetown have rarely focused on this settlement. This lack of attention is exemplified by the government's low prioritisation of Kroo Bay in the provision of urban services and infrastructure. Kelly and Adger (2000: 329) have argued that because institutions determine 'entitlements' and the type of settlements that occur, they therefore influence the vulnerability that takes place. Van Den Broeck (2008) has also indicated that planning processes are generally embedded within an institutional context. Because it is this context that shapes what kinds of development that takes place and where, it has led to the differential development of Freetown with Kroo Bay, which attracts less government attention, having most of its houses being less flood resistant. This is because instead of using cement (1) which is generally much stronger, the walls are made of sticks and corrugated sheets. This partly reflects the inability of most residents to invest in better building materials. In giving reasons for the fewer number of brick houses in this settlement, one respondent explained as follows:

*"We can't avoid using sticks and iron sheets in making our homes because that's all we have got. We are poor and can't even afford to feed our families suitably." (FG3-KRB, respondent 5, 2009)*

Most of the land here has been reclaimed from the sea owing to the high cost of land in the inner city. The pervasive practice of filling shallow waters with mounds of rubbish in order to build on them is expressive of people's desperation to have a place to live, regardless of the cost to security. Several of these houses lack the required capacity to withstand the pressures exerted by floods. Kroo Bay is highly sensitive to sea level rise because several of the houses that have been built through this land reclamation process have already slowly started to sink, especially as more mud and gravel are washed down by the streams. The generally appalling state of the toilet system, due to the inability to afford private toilets and the inadequate ways in which the few community toilets have been managed, further exacerbates the sanitation situation. This is compounded by the congestion and overcrowding of the settlement, owing to the few bedroom spaces in relation to the large size of households, which generally exceed the 6.2 national average. Other areas of vulnerability for Kroo Bay relate to its high concentration of such vulnerable groups as single female heads of household (1). It is also here that households with no formal education (1) proliferate. It is therefore not surprising that several household heads here work mostly in trades relating to the primary sector.

Even though coping capacity in Freetown was observed to be generally low, Kroo Bay demonstrated a much higher capacity to cope (0.06) relative to the other study areas. As Table 7 shows, this is in part because of the high awareness of its residents about climate change (0.09) and of the risks associated with disasters. Other aspects of its capacity relate to the high proportion of residents who take action, the high participation of respondents in community decisions, the possibility that some residents are able to relocate elsewhere in the event of hazards, and the relatively high support that they receive when disaster occurs. Despite its relatively higher coping capacity, most of the activities that residents undertake are not informed by any prior training on how to cope (0.86). This therefore suggests that unlike Smith *et al.*'s (2003: 16) proposition, an enabling environment is not the only factor that makes households willing to adapt. Rather and as Grothmann and Pratt (2005: 202-203) note, the perceived probabilities of being hurt by flooding have been the key reason.

### **5.6.3 Kingtom**

Kingtom is the third most vulnerable (0.32) of all the study settlements, with its vulnerability status ranked as moderate. As Tables 9 and 10 show, the vulnerability of

Kingtom results mainly from the socio-demographic characteristics of its households, with the settlement having the second highest composite index of 0.12. This weakness is, however, more than compensated for by its relatively high adaptive capacity (0.07), which makes it a bit less vulnerable than Aberdeen. As Table 7 shows, Kingtom is far less exposed to hazards than Kroo Bay and East Brook. This is due largely to its relative safety as one of the few well-planned settlements, with a large part of its coastline protected against tidal waves and slides. Consequently, only a few hazard-related deaths (0.5) have occurred. These deaths and injuries have occurred mainly in the unprotected areas along the coastline where flooding and strong tidal waves affect most of the irregular dwellings that have emerged. The poor housing construction in these areas, owing to poverty and the poor enforcement of building and planning codes, have increased human susceptibility to the recurring hazards. Several of the dwellings here are without private taps or water wells (1) which make some people walk long distances in search of water. In explaining her ordeal with water problems in this settlement, one household head reported thus:

*“Most of the houses you see here have been without serviced water for many years. We only get water from the street pipes but even at that, they are so few. Because we don’t have vehicles to get water over long distances like the better offs, we have to stay awake for most of the night to fill our drums. That’s the only time to fetch water otherwise you may not get even a cup-full during the day. The tap is always crowded.”(FG2-KTM, respondent2, 2009).*

In some parts of Kingtom, water problems have meant that some families secure drinking water from polluted sources which further increases the spread of diseases. This inconvenience has worsened for many households due to the sheer lack of corrugated roofs (0.67) for some houses to protect residents from the heavy rains that occur. The poor state of housing in some of the areas damaged by the war now accounts for the high levels of sanitation problems in the community. The existence of these appalling conditions in some sections of Kingtom supports an earlier result in Section 5.5.2 which showed that in both Kingtom and Kroo Bay, living in a formal settlement is not the determining factor underlying the conditions of dwelling houses, the living environment and the water supply systems. As many scholars (Każmierczak and Cavan, 2011; Satterthwaite et al., 2007; Pelling, 2003; Kelly and Adger, 2000) have emphasised, it is these socio-economic conditions which constitute the local context of places that will have to coalesce with hazards to aggravate climate change impacts.

Kingtom is socio-demographically vulnerable to climate change because it currently has the highest concentration of old people (1) (60 years+) with limited capacities to endure the current vulnerabilities which climate change will aggravate. Already, a significant proportion of the households are headed by single female heads (0.54) with no partner to mobilise or jointly pool resources together. Given the low wages and the poor conditions of service in Sierra Leone, such households will be adversely affected by any further strain from climate change. These, together with the high unemployment rate (0.58) will coalesce to undermine both individual and collective efforts at coping with hazards. This will be exacerbated by the high level of ignorance about climate change issues in this settlement. Kingtom however has a higher capacity to adapt. The main adaptive capacity here relates to the willingness of residents to work together for community building, the prevalence of high coping practices (0.1), and the training activities that have been carried out for households on coping strategies.

#### **5.6.4 Aberdeen**

Tables 9 and 10 show that Aberdeen is the least vulnerable settlement (CVI is 0.25) despite having a much lower adaptive capacity (0.17). Vulnerability here is rated as low, primarily because of the low incidence of climatic disasters. As Table 7 shows, fewer hazards occur in Aberdeen because not many residents are exposed to risks. This is in spite of its relatively low altitude. Although hazards such as flooding and heavy rains do also occur here, the impact is usually far lower than at Kroo Bay and East Brook. This is because of the better infrastructural provisions (good roads and drainage) that have been made within this settlement. Several studies (Huq *et al.*, 2007; Reid and Satterthwaite, 2007; Stern, 2006; IPCC, 2001) have associated improved infrastructural conditions with lower vulnerabilities since it work to reduce hazard exposure. Nevertheless, tidal waves do regularly take place along the coastline and estuarine areas, where they presently affect several dwellings that have lately emerged along the coastal fringes. As an undulating settlement that is bounded by an estuary that connects freely to the sea, tidal waves result mainly from transitional effects related to the location. This subjects several parts of the low-lying estuarine area to such marine influences as tides and waves that have now become more regular. With a predicted sea level rise of about 1 metre by the end of the century (IPCC, 2007), most of this area, including the flood plains of Kroo Bay and the

coastline areas of Kingtom are likely to be overwhelmed by flooding. Yet as the analysis shows, Aberdeen is the settlement that demonstrates the least capacity to adapt.

The above assessment has thus, supported the works of Simon and Fragkias (2008: 11) and Hein *et al.* (2008) that settlements are unequally exposed to climate change owing to the differences in the local socio-economic and political conditions of places. Kreimer *et al.* (2003: 92) had earlier observed that in poor cities, informal settlements can be more prone to climate change since many have been built in unsafe locations. In line with Moser *et al.* (2010) and Lovbrand (2004: 28), this work has found that vulnerability in these (four) settlements is high because of the societal constraints which people face, as exemplified by the widespread poverty, inequality and the lack of access to urban services. Since most of these settlements have developed outside formal planning systems given the dominance of low income groups, the dwellings here have been made without due consideration to the potential climate change risks. The settlements continue to expand in this way due to population pressures on the city and the inability of many households to acquire land in safer places. Prior to considering the role of planning, it is important to analyse the specific category of people who are more likely to be affected by climate change.

### **5.6.5 Who are the most vulnerable?**

The vulnerability assessment has shown that residents of the informal settlements of Kroo Bay and East Brook are the most susceptible to the adverse effects of climate change. Nevertheless, it is important to note that vulnerability is dispersed broadly across the Freetown settlements and that the vulnerability which individuals face differs widely. Although several factors account for this, the principal causes relate to the topography of settlements, the type and place of housing location, the level of hazard exposure, and the coping characteristics of residents along with their individual characteristics. As the analysis shows, it is these attributes which determine the unequal distribution of vulnerability and the extent to which people are able to resist or cope with climate change impacts. One category of respondents who have been adversely affected by the current climatic hazards and who are among the most vulnerable to climate change impacts is the urban poor. In Freetown, the poor are most vulnerable because a large proportion of them live either along the coastal fringes or along the hill slope areas where landslides are more regular. Vulnerability is high among this population since many dwell in poorly built

houses particularly along the coast where sea levels are predicted to rise. These places already coincide with the areas where all the reported deaths recorded in this study have taken place. As Table 7 shows, the number of deaths is particularly high among residents in Kroo Bay (1) and East Brook (0.75) because the two communities concentrate a significant proportion of this population. The causal factor of vulnerability within this group is directly related to the strong influences which societal processes, mindsets, regulations and policies have on individual and organisational decisions in determining access to resources. It is these taken-for-granted schemas that influence decisions (Mahalingam and Levitt, 2007: 523) on how and where infrastructure and services are provided, including access to land, and the types of developments that takes place, and they have had the joint effect of limiting access to the poor.

Even among the urban poor, it has been learnt that vulnerability is highly differentiated, with the unemployed and self employed residents being the most vulnerable. Vulnerability is high among this category because they demonstrate a predominantly subsistence livelihood. Many lack the financial resources to build suitable dwellings to protect themselves and their families from hazard threats. At Kroo Bay and East Brook, it was common for such respondents to report losing either their trade wares or their home-based enterprises to flooding. This has often resulted in job losses and the erosion of livelihood support. In expressing his disappointment at the loss of his small business to flooding in Kroo Bay, one respondent stated as follows:

*“It took me five years of hard savings to start running that ‘video show’ business. Now that it is damaged, I wonder how I can get another. As you can see, I am fairly old now. I have no job or any other means of livelihood apart from this business which I thought was going to take care of my old age.”(FG3-KRB, respondent 6, 2009)*

These same people experience the highest degree of damage to their dwellings which further worsens their existing state of vulnerability. This trend is particularly dominant at Kroo Bay, where the low elevation of the settlement and the poor drainage systems frequently cause oceanic tidal surges and the overflow of rainwater.

Even among employed residents, it was observed that depending on the type of jobs they do, a significant proportion also live subsistence lives. Because earnings are generally low in Sierra Leone, residents have to undertake several trades in order to make a living. For female-headed households and respondents who are either divorced, or widowed, this

presents an extra challenge to their daily struggle for survival, since with no partner to pool earnings with, they have to do it all alone. For many families, these jobs are normally undertaken in addition to their domestic chores, which make it very difficult for some to participate in community activities. Female-headed households face a further vulnerability because of the discrimination they have historically faced as a result of their gender. These relate to their restricted access to credit facilities, their limited inclusion in decision-making processes, and the culture of restricting their access to the inheritance of family assets.

High vulnerability was additionally observed among residents with large household sizes at Kroo Bay, Kingtom and Aberdeen. At Kroo Bay, one main cause of vulnerability within this group is the over-crowdedness of their dwellings. Overcrowding is persistent because plot sizes here are very small, specifically because of the difficulty of the terrain. This, in addition to the appalling drainage, the poor and inadequate service provision, along with the inappropriate building conditions, creates the slum-like conditions that are now characteristic of this settlement. When flooding usually take place in this settlement, it is this category that is most affected. In recounting her ordeal with the most recent flood that occurred at Kroo Bay, one petty trader at one of the focus group sessions explained thus:

*“Our concern was to rescue the kids, not properties. It was in fact, inconceivable to think about properties given the limited time we had. The torrents gushed into the house and the only choice left was to flee. It carried nearly all our belongings, but we thank God that we are still alive.”(FG3-KRB, respondent 3, 2009)*

In their desire to expand their dwellings or have additional living space, several residents here have embarked on some form of land reclamation from the nearby ocean. This involves the use of mounds of rubbish to fill plotted areas which are layered with soils or mud in order to build a house on. The high unemployment level in this settlement is indicative of the inability of several people to build better and stronger houses that can resist floods and tidal waves. At Kingtom, older people are among the most at risk because of their limited ability both to protect themselves and to cope with the hazards.

Having examined the scale of vulnerability in Freetown and the contextual and institutional factors that may have led to it, a more detailed examination of the adaptation process will now be undertaken. Analysing adaptation at the household level is important because it provides an understanding not only of the current capacity gaps at this level but

also of the challenges to urban planning of addressing vulnerability in the various irregular settlements where such households abound.

### 5.6.6 Adaptation activities

In order to assess the main coping strategies used by households, respondents were asked to identify the different activities that they usually undertake when faced with hazards and to confirm whether this is informed by their current knowledge of climate change. Three hazard types (flooding, landslide and heavy rainfall) which have usually caused some of the major disasters in Freetown were considered for this assessment. Even though the strategies used were assumed to differ widely according to the different hazard types, it was found that because heavy rainfall and flooding affect the same areas that are also prone to landslide, identical coping strategies are normally used by households. This approach to adaptation has long been suggested by Smith and Lenhart (1996: 194) who argue that under conditions of high climate uncertainty, it is better not to target adaptation measures to only one type of risk. It was observed however that in spite of the range of coping activities that exists, only a few residents actually take such actions.

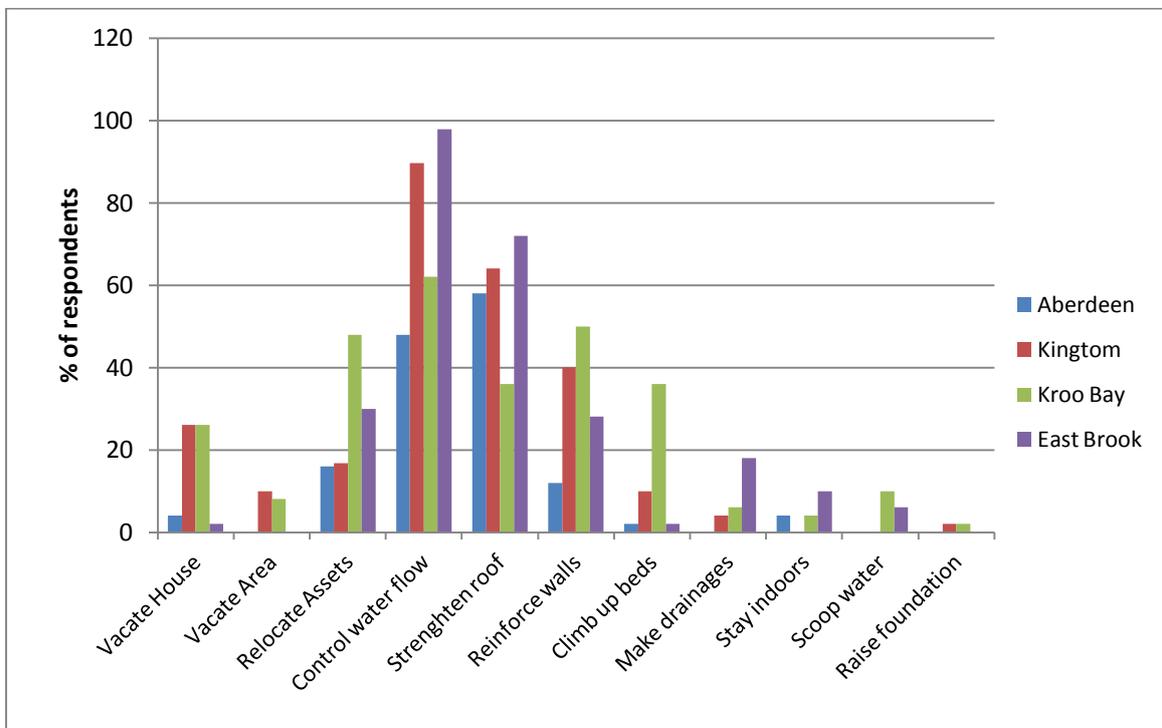


Figure 14: Household coping strategies

Source: Field work (2009)

As shown in Figure 14, the most popular coping strategy in the study area is the control of inflowing water from houses and compounds as is evident in East Brook (97.8%), Kingtom (89.6%), and Kroo Bay (62%). This, along with the strengthening of house roofs prior to the start of the rainy season, constitutes the key response action in both East Brook (72%) and Kingtom (64%). Although these same coping activities are undertaken at Aberdeen, the premium given to each differs significantly, with the latter being the most regularly used option by residents (58%) compared to the former (48%). We can also see that unlike the other settlements where only two coping strategies are more prominent, Kroo Bay seem to have a much diversified set of responses. For example, apart from controlling water flows, responses such as reinforcing the walls of houses (12.5%), relocating assets (12%), strengthening house roofs (9%), and climbing up onto beds or roof tops (9%) are also used. These different response strategies reflect both the different topographic and bio-physical characteristics of settlements (Kroo Bay being a flood plain) as well as their varied socio-economic conditions which determine the unequal distribution of risk (Romero Lankao and Qin, 2011; De Sherbinin et al., 2007). For instance, residents in formal and better planned settlements like Aberdeen and Kingtom are far less concerned about relocating assets, due to the level of infrastructural development in these areas and the ability of many residents to invest in their own personal safety. On the other hand, residents in the many corrugated dwellings (pan body) of Kroo Bay appear to be less bothered about strengthening their roof tops and would rather reinforce walls or control water flows. This is largely because the harm that they experience results not so much from leaking roof tops but from the excessive waters that gush down slopes into their compounds.

Nevertheless, the limited coping strategies observed in all these settlements along with the widespread poverty and the limited coastal infrastructure in many places makes several areas vulnerable specifically to flooding, sea level rise and coastal surges. This will be aggravated by the limited awareness about climate change in some settlements, the low capacity support that communities receive from the government and the lack of early warning systems about hazards. Nevertheless, it was observed that in some areas, the use of local knowledge is now a valuable means of predicting weather conditions. Respondents of some hazard-prone areas also reported attending awareness-raising programmes organised by certain local Non-Governmental Organisations (NGO's) on disaster management.

### **5.6.7 Summary**

From the above analysis it is clear that vulnerability in Freetown is much higher in the less privileged and informal settlements than it is in the planned settlements. This is because of the low investments made by governments (local and national) in improving the living condition of people in these places. The analysis has repeatedly classified these areas as the most vulnerable places of Freetown because in addition to their unsafe locations, they concentrate the highest population of low income groups who live mainly in very appalling conditions. Whilst the urban poor are generally the most vulnerable in these settlements, it is the unemployed and self employed population who are most vulnerable to climate change. This is because of the high densities of their dwellings and the limited access that they have to better and more reliable provision of urban services and infrastructure. The areas where these people settle have developed largely as a consequence of inadequate planning systems, along with the failures of governments to appropriately manage the city's urbanisation process. With the predicted changes in climate as already evidenced by the incidence of extreme temperatures and rainfall events, it might be argued that many of these areas will be severely damaged by climate change.

### **5.7 What Climate Change Impacts that Urban Planning should be concerned about in Freetown?**

This section draws from the foregoing analysis along with the projected climate changes for Freetown (see sections 5.3.1 to 5.3.3) to discuss the potential climate change considerations that should be integrated into urban planning processes. As has been shown in the afore-named sections, downscaled data from Global Circulation Model (GCM) outputs for Sierra Leone could have been used to assess these future changes in climate. This was however not possible given the circumstances of this study. It is not the case that downscaling is not possible but that in spite of its significance, such work is very difficult given the time and resource limitations of this research. It is however considered to be a very important area for future research. Such a study can arguably provide understandings about the future climate changes of Freetown uncomplicated by other drivers of change at the national level. Since the purpose of this study is to discuss how climate change concerns can be integrated into urban planning processes, the use of the climate projections, especially those relating to Sierra Leone are very useful. This is because very

little variation exists in the country between places in terms of both the weather and the climatic conditions. This study recognises that uncertainties are bound to be high, since in addition to the uncertainties that pervade nearly every aspect of climate modelling and prediction (see Quiggin, 2008), the projections here are not directly based on climate data for Freetown. However, this study argues (from a planning perspective) that it is best to act to reduce the catastrophic damage inferred from the available data, than to wait until uncertainties have been resolved.

### **5.7.1 Water resources**

Climate change will affect water resources through the predicted changes in precipitation and temperature levels. This will be influenced by the rates of evaporation that will occur along with the range of deforestation activities taking place. Already, several areas of Freetown face acute water shortages with water availability being severely under threat. This is largely due to the expansion of the city, the rapid population growth, and the resultant increase in water demand. While domestic water demand is projected to fall from 59% in 2006 to 58% by 2016 (Pratt, 2007) owing to the resettlement of a proportion of the rural-migrant population to the provinces, it is conjectured that water supply in Freetown may not be adequate to meet the city's future water requirements. In spite of existing projections that precipitation levels in Sierra Leone will not be decreased by climate change (McSweeney *et al.*, 2008), the acute lack of water storage facilities (reservoirs/dams) and the inability of the city to tap from the pool of its underground water will pose the greatest challenge in meeting the water supply needs of Freetown. With soil moisture likely to decline due to high temperatures resulting from climate change, the large proportion of the city's population that depend on streams and boreholes for their water supply needs may be severely affected. When coupled with population growth, deforestation rates, increased water demand, and seasonal variations in precipitation (especially during the dry season), these extra water sources might not be adequate to satisfy the growing demand for water. Freetown will also be affected by seasonal variations in river courses in the provinces, particularly along the River Rokel where the Bumbuna Hydroelectric Scheme which supplies the city's hydropower is located. Such variations may cause the closure of turbines at the peak of the dry season with severe implications for power supply needs and the overall functioning of Freetown.

### **5.7.2 Human health**

With climate change, Freetown will potentially experience a major increase in the human health problems already faced by a significant proportion of its population. Already, the city is prone to a range of climate-sensitive diseases, including malaria, cholera, diarrhoea, typhoid fever, and measles which are caused by the heavy precipitations that occur coupled with the poor living conditions of most of the population. Health impacts will be intensified by the occurrence of flooding, landslides, and mudflows, which will be likely to increase the incidence of injuries, loss of life and properties, damage to urban infrastructure, population displacement and the contamination of water supplies. Various studies have shown that the incidence of malaria, cholera, diarrhoea, and typhoid have been generally high in Sierra Leone and that the risk of future transmissions is potentially very high. These communicable diseases, which are associated with high illiteracy levels, unsafe water and the poor sanitary conditions of settlements, result in high death and morbidity rates every year with severe implications for certain categories of people (children, the elderly, the sick) who are the most vulnerable. A WHO country report (2009) indicates, for example, that globally, Sierra Leone has the highest under-five mortality rate and that malaria alone accounts for 25% of all such mortality. Climate change-induced health problems will be particularly high among the low income groups in the slums and other informal settlements, where living conditions and service deliveries are generally very poor.

### **5.7.3 Human settlements**

Climate change impacts on the Freetown settlements will occur in different ways ranging from severe winds, high temperatures, and extreme rains, to flooding, landslides, erosion, coastal indentations and sea level rise. Impacts will be felt either directly or indirectly (e.g. epidemics) with the severity being greatest among the low-income groups who live mainly in unsafe locations. This may cause massive displacement and movement of populations, as well as the densification of inner city areas, where people from such already at-risk areas as flood plains, bays, and wharfs along with the low-lying and unprotected coastal settlements may move to settle. Flooding and heavy rains in particular, may aggravate the inundation of many of the hill slope areas thereby accelerating debris and mud flows down slope which will cause obstructions to transport flows, drainage ways, and the accumulation of waste in some houses and compounds. In the rainy season, flooding has

constantly caused severe traffic jams in many areas of Freetown and the spread of waste and wastewater from sewerage which leads to the contamination of piped water (owing to damages) and the spread of diseases. As a result of sea level rise, many coastal settlements will also be inundated thereby affecting the properties and livelihoods of the thousands of poor people who source their living directly from the informal activities that operate within their neighbourhoods.

#### **5.7.4 Urban infrastructure**

Similarly with the global projections of an estimated sea level rise of about 17cm by the 20<sup>th</sup> century and 59cm by the turn of the century (IPCC, 2007), the sea level in Sierra Leone is projected to rise to between 13cm (in 1980-1999) and 56cm by the 2090s (Pratt, 2007). Sea level rise is likely to accelerate erosion and the inundation of coastlines along the low-lying coastal settlements, where most of the strategic infrastructure (port, oil terminals, tourism industry) of Freetown is located. This will be reinforced by the increased incidence of torrential rainfall which is already deepening the vulnerability of many settlements where the effects of flooding and landslide are more severe. With climate change, the probability and intensity of such hazards will increase, resulting in the destruction of coastal roads, bridges and port facilities and hence disrupting commerce, transportation systems and the overall functioning of the city. The destruction of roads (potholes), drainage systems, and water pipes from the collection of rocks and debris that are washed down the surrounding hills during heavy rains and floods is now a regular phenomenon in most parts of Freetown. The storms that accompany these rains also intensify the damage that is caused to the electrical and telephone cables that overhang the street poles. This will not only pose severe risk to human life but will also have implications for the availability, quality and access of a significant proportion of the city's population to these services. As Houghton (2004) notes, most of this infrastructure has been developed based on past climatic conditions, with the assumption that the future climate will remain the same as today. Given the marked disparity in the provision between settlements, the impact on urban infrastructure will vary between places and between settlements with the informal settlements that lack the necessary provisions being the most affected.

### **5.7.5 Coastal areas**

Pratt (2007) indicates that over 70% of the most vulnerable coastal zones in Sierra Leone are concentrated along the Freetown Peninsula. This zone corresponds to the area where the Freetown settlement has evolved. The zone is the most densely settled area of Sierra Leone because it concentrates almost twice (about 120 persons per km<sup>2</sup>) the country's average population density (67 persons per km<sup>2</sup>). Nearly all of this population lives in Freetown, mainly in settlements where coastal erosion, inundation and flooding are already very active. Even though it is as yet very difficult to estimate the exact impact that climate change will have on coastal Freetown, owing to the lack of 'accurate' topographic data (Pratt, 2007: 115), it is estimated that sea level rise will have serious implications for coastal Freetown. Sea level rise will accelerate the rate of recession already taking place along the sandy shores in addition to increasing the rate of movement of littoral deposits due to the intensification of storms. These strong storms will further the destruction by the sea of such coastal structures as jetties, which have always served as buffers for coastal settlements against the sea. It will possibly intensify tidal waves, which are already very active along the bays, estuaries and beaches. The coastal environment and the settlements and infrastructure within this area are already exposed to a range of marine and land-based hazards (strong tidal waves and shoreline erosion), and it is likely that these same impacts will be intensified under climate change. Increases in sea level could affect most of the developments along the coast and may also cause salt water intrusions, salinization and the contamination of coastal aquifers, with implications for the quantity and quality of ground water resources. The continued habitation of these areas, especially by the poor who normally eke their livelihood from the sea further compounds the pressures exerted on the resources within this zone.

### **5.7.6 Summary**

From the foregoing, it is clear that climate change presents a variety of consequences for Freetown which urban planning should address. These consequences, which have been discussed under five separate themes, relate mainly to problems of water resources, human health, human settlements, urban infrastructure and coastal location. It is argued that such knowledge is critical to urban planning, since several of the issues fall within the sphere of its activities. This research has pointed out that despite the uncertainties surrounding the data, the mere knowledge that a threat of damage to city-wide processes is imminent

should be sufficient to stir prompt responses by planners. This relates to the precautionary principle that is at the heart of the urban planning profession. This study therefore suggests that rather than wait until climate change predictions are made more certain, planners can start by acting on the empirical information that is already available.

## **5.8 Greenhouse Gas Emissions**

This section examines the main GHG emission sources in Sierra Leone and the actions taken by the national government to address them. It reveals that whilst it is important to align climate change response actions with the key priority concerns of nations (and places), there has been a tendency for the UNDP/UNFCCC/GEF which provides support to the climate change project in Sierra Leone to set pre-defined outcomes which the country is required to meet. It is shown also that apart from the national level, no emission inventory exists for Freetown (the local level). This section emphasizes that it is important for Sierra Leone to promote mitigation activities at a local level since it is at this level where GHG emissions actually occur. Therefore, it is vital to have a clear picture of the emission situation in Freetown. It is recognized, however that, because Sierra Leone's GHG emission levels relative to the global total are insignificant, it is reasonable for planning processes to prioritise adaptation responses. This argument builds on existing knowledge that the least developed countries and cities are the most vulnerable to the adverse effects of climate change, owing both to their levels of exposure and their limited capacities to adapt. This argument notwithstanding, it is recognized that promoting mitigation responses is also necessary, especially as Sierra Leone aspires towards future growth in its economy.

### **5.8.1 The state of GHG emissions in Sierra Leone**

The study found that energy use and land-use change (through agriculture and deforestation) are the dominant greenhouse gas (GHG) emission sources in Sierra Leone. The main gases emitted in the country include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrogen oxide (NO<sub>x</sub>), carbon monoxide (CO), and non-methane volatile organic compounds (NMVOC) (Pratt, 2007). Nevertheless, apart from the national level where inventories are taken, there is limited and disordered information, especially for Freetown

where many of the country's production enterprises, population densities, and on-road vehicles are found. Methane is Sierra Leone's most emitted greenhouse gas. Its main source, which is rice cultivation, is however limited to the rural areas where the slash and burn method of rice cultivation is dominant. In the urban settlements, CO<sub>2</sub> is the most emitted gas. In 1990, Sierra Leone's total CO<sub>2</sub> emission was 360,000Gg of which 303,058Gg were removed through various carbon sequestration processes. Even though the CO<sub>2</sub> level is likely to increase to 580 parts per million (PPM) by 2025 and to about 700 ppm by 2100, it is still insignificant when compared to the global and sub-regional totals (Pratt, 2007). For example, Sierra Leone's total CO<sub>2</sub> emission in 1998 was 522,000Gg. As a percentage of world CO<sub>2</sub> production totals, Sierra Leone's contribution was nil (0.0%) (EarthTrend, 2003). For the same amount and year, Sierra Leone accounted for only 2.1% relative to the rest of Sub-Saharan Africa. It might be argued that even with the expected rise in emission levels by 2025 and 2100 based on current emission trends, total emissions for Sierra Leone will still remain below the 1990 emission levels thus, qualifying Sierra Leone as a low CO<sub>2</sub> emitting country under the Kyoto Protocol.

The CO<sub>2</sub> emission level is low because 65.7% of all businesses operating in Sierra Leone are small-scale (sole proprietorship) with the bulk (54.1%) concentrated in the Western Area. This large concentration is due mainly to the primacy of Freetown as Sierra Leone's capital city, and consequently, the large market that it commands compared to the other urban centres (Statistics Sierra Leone, 2009). In spite of this, emissions in Freetown are generally insignificant. Another key reason for this low emission level of the country is the lack of industrial development, the low per capita consumption levels and the widespread poverty. This is exacerbated by the country's lack of attractiveness to foreign investors, regardless of the many institutional reforms it has undertaken. On the basis of its low emission status, this research takes the position that because Sierra Leone is likely to be more of a victim rather than a perpetrator of climate change, adaptation rather than mitigation ought to be prioritised in all of its urban planning responses. This is principally on account of the pervasiveness of vulnerability in the country. It is practical to prioritise adaptation in Sierra Leone (specifically, Freetown) because many settlements are likely to be disproportionately affected by climate change, owing both to the massive adaptation deficits and to the high poverty levels. While this position is reflected throughout this research, it does not however disregard the need for mitigation. Mitigation will be required to reduce emissions that will result from the future need for energy and economic growth.

Because efforts are already on-going to attract foreign investment as part of the country's attempt to alleviate poverty, mitigation strategies that explicitly address future emissions increases would be required. Mitigation activities may however face difficulty in Freetown owing to the lack of a clear inventory about the key emission sources that planners have to deal with. Having looked at emissions at the country level, the next subsection will now examine the main CO<sub>2</sub> emission sources in Freetown.

### **5.8.2 The main CO<sub>2</sub> sources in Freetown**

In Freetown, the transport sector is one of the principal sources of CO<sub>2</sub>. Other sources include energy production, and building construction industries. In 1985, these three sources accounted for 95% of all carbon production in Sierra Leone. The transport sector alone contributed 65% of this total. This sector will continue to be the lead carbon emission source by 2025 (Davidson, 1993). The transport sector produces the most carbon in Freetown because of the high demand it makes on fuel oil. The bulk of the CO<sub>2</sub> emissions in this sector result mainly from road transport. Emissions have risen because of the sharp increase in vehicle importation and ownership. Cars and light vans constitute the bulk of all such vehicles. Since 2002, over 75% of all imported vehicles in Sierra Leone are old and used. This trend is expected to rise massively by 2025 if urgent action is not taken now. The implication for climate change from this high rise in the importation of old and used vehicles in Freetown is the limitations it will pose to fuel efficiency mitigation measures. One main reason for the rise in the importation of old and used vehicles is the low tariff that tends to be levied at Customs. Another reason relates to the high poverty rate in the country, which makes new vehicles less affordable by a vast proportion of the country's population. Whilst it emerged that the country's Road Transport Authority (RTA) has already commenced actions to reduce CO<sub>2</sub> emissions from this sector, its actions are limited by the non-availability of the required materials (emission tester) to measure the actual CO<sub>2</sub> emissions of vehicles. Other approaches used relate broadly to road traffic management. This is in spite of the prevalent congestion of traffic that is still a major problem in the city. With regard to the latter, a hill-side road is currently being constructed which seeks to connect the eastern and western sections of Freetown without having to pass through the city centre where congestions abound.

Alternatively, the emission of CO<sub>2</sub> from the energy sector results mainly from the power generation plants operated by the city's main energy supplier, the National Power Authority (NPA). Electricity is the main form of energy produced and it is derived from the combustion of petroleum oil. This process releases a significant quantity of carbon dioxide into the earth's atmospheric system, with implications for climate change. Whilst electricity consumption in Sierra Leone has always been much higher in Freetown than elsewhere, it was difficult to obtain data on its actual contribution to the country's total carbon emissions from this sector. This study found, however, that a much higher proportion of households in Freetown depend on charcoal and wood for their energy needs. These consist mostly of the low and middle income groups. In 2008, Freetown consumed about 400,000 m<sup>3</sup> of fuel wood, representing 10% of the estimated 4 million m<sup>3</sup> worth of fuel wood produced in the country (Kulubya, 2008). This amount is far higher than the total 299,000 m<sup>3</sup> that was consumed in 1985 (Cline-Cole, 1987). What these figures suggest is that even though it was difficult to get a clear estimate of the total CO<sub>2</sub> emission from these activities, significant quantities may have already been discharged through these two processes alone. Apart from poverty, which limits the access of many households to the use of electrical energy in Freetown, the supply of power is itself both poor and irregular, notwithstanding the immense resources that have been invested in it.

With regard the built environment, CO<sub>2</sub> emissions result mainly from the consumption of electricity and kerosene. Although no specific estimates about carbon emissions from buildings were found for Freetown, it was established that, for the Western Area, which consists predominantly of Freetown, 62.31% of all households use electricity and 35.32% use kerosene respectively (Government of Sierra Leone, 2007). Yet, because electricity supply in Freetown is generally poor, carbon emissions from this sector relative to other cities in least developed countries may be negligible. A key finding, however, was that because the houses in Freetown are made of cement and iron rods, they already have a lot of energy embedded in them. This energy level is expected to rise with climate change, as more heat is absorbed from the rising temperatures. This may stimulate a rise in the demand for air conditioners, thereby leading to further CO<sub>2</sub> emissions. Emissions will be aggravated by the high level of poverty in the country, which forces people to use more sub-standard materials for housing development. Already, many of the products (Zinc, electrical appliances) used for housing construction are substandard, since a high proportion of households can rarely afford the prices asked for quality materials. When

asked about whether or not energy efficiency considerations are usually made in housing construction decisions, one professional in the building construction industry replied as follows:

*“When we talk about energy efficiency here, we are only looking at such issues as – what kind of materials will help reduce my light bill, or make my house last longer. Just that o.k.? You see, once we build a house here, it’s forever. We don’t have that luxury of making adjustments to buildings (retrofitting) every two to five years or of demolishing one structure to put up another just for energy efficiency sake – we don’t have that luxury. So where we live as well as our economic situation, limits our appreciation of energy efficiency.” (EP-PBE2, 1990)*

The next subsection will now look at the range of actions that have been undertaken by government to mitigate GHG emissions in the country.

### **5.8.3 How have GHG emissions being addressed in Sierra Leone?**

As a party to both the UNFCCC and the Kyoto Protocol, Sierra Leone has carried out various actions to deal with climate change. Most of these activities have taken place at the national level, mainly in central government ministries. Nonetheless, because several of the actions focus both on emissions and vulnerability issues, it is difficult to classify them distinctively into mitigation-specific or adaptation-specific responses. The UNDP, acting on behalf of the UNFCCC and the GEF, has pioneered most of the climate change activities in Sierra Leone. As a result of the support (funding and technical) they provide, these bodies have usually imposed their own agendas which limit the government’s control over the response process. One example of this has been the importance they have always attached to mitigation issues, in spite of the huge vulnerability that exists. A key mitigation activity that has been carried out in Sierra Leone relates to the assessment of the country’s GHG emission status, which was submitted as part of its Initial National Communication (INC) to the UNFCCC. This report specifically highlights key GHG emission sources and the amount of emissions that have occurred in the country. Sierra Leone is currently working on the Second National Communication (SNC) which is hoped to increase understandings about the specific mitigation actions to be prioritised. Other activities include the setting up of an Environmental Protection Agency (SLEPA) which monitors the country’s emission levels; the establishment of an ‘Inter-Agency Committee’ to promote coordination in all environment-related issues; and plans to develop capacity

within the Meteorological Department (MD) which currently hosts the Secretariat for Climate Change in Sierra Leone.

One critical challenge faced by the mitigation process is that outside the MD, very little is known about the harm which GHG emissions present to the environment. Additionally, considerations of climate change issues are neither required in policies about energy, forestry, planning and land, nor do they feature specifically in the recently enacted SLEPA Act. In spite of this, it was observed that in the last five years, the government through its relevant ministries has worked to promote mitigation through the increased conservation of some major ecosystems in the country. These include the Freetown Peninsular forest which was up to then (and still is) one of the main deforested forest reserves in Sierra Leone. The government has also embarked on promoting the increased exploitation of the vast renewable resources (biomass, solar, hydropower) of the country in an attempt to reduce the emission of GHGs. Other notable actions include the government's effort to exploit the Carbon Trading (CT) and Payment for Ecosystem Services (PES) schemes. The latter involves a voluntary prohibition by the government in the mining of all minerals in some defined strategic forest reserves of the country, in order to enable them to serve as carbon sinks. In considering the role of households and of local government, it was observed that very few mitigation activities are consciously undertaken at this level. Most of such actions (e.g. tree planting) are not only rudimentary but also largely disorganised, with households, community groups, NGO's and the FCC all carrying out similar activities disjointedly.

## **5.9 Summary and Conclusion**

This chapter has examined both the current and projected changes in climate and the various concerns it present to Freetown. The concerns have been discussed under three broad topics relating to: vulnerability to climate change, climate change impacts, and GHG emissions. Discussions on the first concern have shown that although vulnerability in Freetown is pervasive, it is the informal settlements that are the most vulnerable places. These same places concentrate the most vulnerable populations, which consist mainly of the urban poor, the unemployed, female-headed households, and households with larger family sizes. Vulnerability is high in these settlements because of their unsafe locations (hill slopes, coastal fringes), the inadequacies of the planning system (old and inadequate

## *Chapter 5*

planning laws that are rarely enforced), the inadequate access to land by low income groups, the lack of services and protective infrastructure, and the generally appalling living conditions of settlements. On the basis of this and the predicted changes in climate, the potential impacts (second topic) that climate change will present to Freetown has been identified. In line with these findings, the chapter has also identified CO<sub>2</sub> as the lead GHG (third topic) that is emitted in Freetown. This is in spite of the city's current low emission status. One key argument emphasised here is that because of the country's low emission levels, it may be plausible for planning processes to focus on adaptation issues. This can however take a phased approach, whereby the current vulnerabilities and adaptation deficits in the city are first addressed, before making mitigation the country's main response priority. This chapter has built on the observed shortcomings in existing knowledge (see Section 2.10) to demonstrate that while cities and planners are urged to take immediate actions to address climate change concerns, it is important to have a more detailed understanding of the implications (vulnerability, impacts and GHG emissions) that climate change presents to the planning process. This will however be difficult in many cities due to the deficiencies in knowledge and capacity among planners addressing climate change.

## Chapter Six

### **Institutional Structures for Climate Change Management**

#### **6.1 Introduction**

Having examined the main climate change concerns for Freetown in the last chapter (Chapter Five), this chapter will now examine the institutional structures for managing climate change in Sierra Leone. It will specifically look at the country's legal and institutional framework; the climate change governance process; and the capacity issues that limit actions to address climate change. The main sources of data for this chapter were interviews and documentary reviews. Documents (policies, plans and law) were obtained both from the selected institutions (where interviews were held) and from certain internet sites, involving an iterative and arduous process. The chapter focuses on exploring how the limited actions in response to climate change at the local level (household, community and city) have been produced by the aforesaid forces and the implications these pose for making climate change an integral part of urban planning decisions and processes. Thus, the chapter addresses the second research question – how does the institutional structure for climate change management support the integration of climate change issues in urban planning decisions? It addresses this question by providing answers to the following sub-research questions:

- (i) What is the legal and structural arrangement for managing climate change in Sierra Leone?
- (ii) How is the climate change management process governed?
- (iii) What technical reasons account for the success (or otherwise) of making climate change an integral part of urban planning and development?

#### **6.2 The Policy, Legislative and Institutional Context for Climate Change**

This section examines the legislative and institutional arrangements for managing climate change in Sierra Leone. It begins with a discussion of some of the country's leading legislation and plans that bear relevance to climate change. It then analyses the existing

institutional arrangements for dealing with it. The key discourses emerging from this analysis are then summarised to bring out the main lessons learned.

### **6.3 The Policy and Legislative Context**

Sierra Leone has no specific policy on climate change, despite ratifying the UNFCCC in 2006. Most of the policy-plans and legislation that have characterised its implementation are more general, with environmental management as the prime focus. A few of the policy strands that can be conjectured from its recent application relate to important national legislation and plans concerning environmental management, sustainable land management, and natural resource management. Key among these framework documents are the following:

- The National Environmental Policy (1990);
- The National Environmental Action Plan (2002);
- The National Biodiversity Strategy and Action Plan (2003);
- The National Land Policy and Land Commission Act (2004); and
- The Sierra Leone Environmental Protection Agency Act (2008).

In demonstrating how these legislations and plans influence the management of climate change in Sierra Leone, the salient characteristics of each framework document are first analysed before drawing conclusions about the specific ways in which they bear relevance to the (climate change) challenges posed. This discussion will take place in accordance with the order in which they have been listed.

#### **6.3.1 The National Environmental Policy (NEP).**

As the first national policy concerning the environment the NEP, which was approved in 1990 and revised in both 1994 and 2002, is a milestone document for environmental management with enormous implications for climate change. This is in spite of its being designed long before climate change was defined as a problem in Sierra Leone. This policy highlights the general principles to be considered by all activities that have potential implications for the environment, in particular outlining the main environmental goals and objectives that underlie Sierra Leone's aspiration for sustainable development. These are

reflected in the various sectoral policies that it sets out relating, for instance, to land use tenure, biodiversity preservation, forest and wildlife preservation, and the conservation of soils. In particular, the policy emphasises the significance of promoting security of tenure to land as a means of limiting the on-going deforestation taking place. Its relevance to climate change can be viewed in terms of the restraints that it poses to the uncontrolled use of forests, along with their natural resources. However, apart from its failure to clearly specify concrete activities to protect the environment at the local level, very few references are made to land use planning. This is regardless of the fact that the two processes (Planning and Environmental Management) are directly managed by the same responsible ministry (MLCP&P).

### **6.3.2 The National Environmental Action Plan (2002)**

Unlike the NEP, this plan (NEAP) sought to identify the specific activities that needed to be undertaken in order to protect Sierra Leone's environment. Most of these activities, which were intended to be integrated into any future national development plan for the country, reflected the dominant themes that were prescribed by the 'Club of Dublin'.<sup>7</sup> These relate to such issues as environmental education and training, environmental information systems (EIS), and the integration of NEAPs into national development plans. Because this plan also ranks and prioritises environmental actions with a strong emphasis on protecting security of tenure, it arguably has serious implications for climate change. This is because of the potential it offers for minimising the rate of misuse of forested lands. However, despite the prevalence of disaster events in slums and other unplanned settlements of cities where land entitlement is usually very contentious, no such protection of tenure has been made.

### **6.3.3 The National Biodiversity Strategy and Action Plan (BSAP)**

Developed in 2003, the BSAP was formulated based on the NEAP. Its relevance to climate change is the highlighting of the state of Sierra Leone's biological and ecological resources

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<sup>7</sup> A coalition formed by some 17 African delegates to the 1990 National Environmental Action Plan (NEAP) meeting in Dublin, Ireland. This coalition sought to support African countries in the development of NEAP.

and the threats posed to their existence. This plan specifically identifies a range of cross-sectoral actions needed to ensure the effective protection and sustainable use of the country's resources. Several of these priority actions relating mainly to such thematic issues as forest management, land degradation, and soil and water management have also been outlined among the key priority activities of the National Adaptation Plan of Action (NAPA). Although the BSAP plan has been developed as part of the country's long-term sustainable development plan, its implementation has been fraught with funding and bureaucratic difficulties.

#### **6.3.4 The National Land Policy and Land Commission Act (2004)**

On the other hand, the National Land Policy was formulated in response to the general state of indiscipline that has characterised the Sierra Leone land market. In Freetown, a major feature of this state of indiscipline is the prevalence of land encroachment and haphazard development which has led to the intensification of vulnerability in many areas. This policy therefore seeks to promote efficiency in the land market by ensuring increased access to land based on "equal opportunity" and "security of tenure". Its major influence on climate change is the power to minimise "the social and environmental implications" of the various types of land uses in the country (Government of Sierra Leone, 2005). Although the Lands Commission Act (2004) which was to form the basis of this policy has been developed and presented to cabinet for approval, the sensitivity of land issues in the country has slowed down progress in the approval process. This has had severe implications for the policy implementation process itself.

#### **6.3.5 The Sierra Leone Environmental Protection Agency Act (2008)**

As the primary environmental legislation currently in the country, the Sierra Leone Environmental Protection Agency Act (SLEPA Act) is an improved version of the Environmental Protection Act (EPA) (2000) which it recently replaced. Prior to this time, the EPA Act was the dominant legislation used to manage the environment, since it was the first legal framework in Sierra Leone that focused directly on environmental protection as a management issue. It was this Act that also for the first time provided the establishment of a separate unit (The National Commission for the Environment and

Forestry) to deal with the environment. This unit was to be specifically assigned with responsibility for minimising the rapid rate of forest clearance and natural resource loss, owing to the damage that it caused to the country. However, because this commission had not managed to acquire a settled legal status (United Nations Environment Programme, 2010) up to the time of elections in 2007, it was dissolved by the succeeding government.

The SLEPA Act that came into being was based on the reconstitution of the Environment Department of the MLCP&E into an environmental agency (SLEPA). Like the EPA Act, this new Act assigned SLEPA with the sole responsibility for managing all environmental protection matters in Sierra Leone. SLEPA is also required to co-ordinate the activities of other bodies on all matters relating to the environment in addition to proffering advice on the formulation of all national environmental policies. By also acting as the environmental focal point for the country, SLEPA is to ensure that Sierra Leone complies with the relevant Multilateral Environmental Agreements (MEA's) that it has committed itself to. Prominent among these MEAs are the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, the United Nations Convention to Combat Desertification (UNCCD), and the United Nations Convention on Biological Diversity (UNCBD). SLEPA additionally has responsibility for environmental governance, the issuance of environmental permits, and to outline the country's environmental standards. Like all the other national environmental legislations and plans, however, the SLEPA Act (2008) did not make any direct reference to climate change. Moreover, all the activities mapped out in the different environmental plans that are implemented by the MLCP&E do not directly address climate change as an issue. Most of the emphasis is on the co-benefits that may result from the implementation of these plans (e.g. water resources management, coastal zone management) in spite of the negative implications they may have for climate change.

### **6.3.6 Other Frameworks**

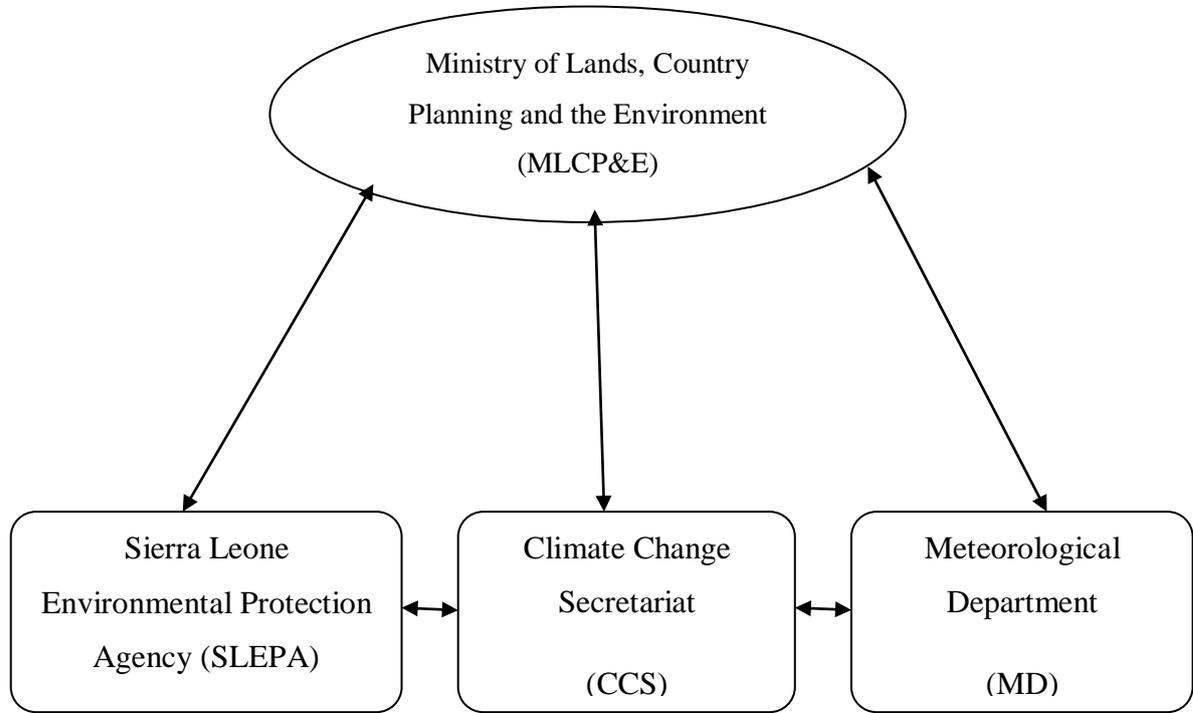
Additional to the above frameworks, there are several other legislations and plans which, even though somewhat old-fashioned and not directly related to climate change, do also provide some guidance to climate change management. Prominent among these are the 1946 TCPA, the Draft Forestry Policy (2003), the Poverty Reduction Strategy Paper/Agenda for Change (2008), the National Conservation Strategy (1985), the Draft

Energy Policy, and the Tropical Forest Action Plan (1990). All of these legislations and plans are intended to address environmental degradation issues by increasing public awareness, arousing public support, and enhancing coordination, with the objective of improving the living and physical conditions in Sierra Leone. Some specific policy strategies within these plans that relate directly to climate change include reforestation, land degradation, loss of biological diversity, and coastal area degradation. Responsibility for these measures and planned activities is however dispersed among several sectoral institutions at the level of the national government.

#### **6.4 Institutional Arrangements for Managing Climate Change**

In spite of the various actions that Sierra Leone has undertaken (Section 5.2.3), the institutional arrangements for managing climate change are still both complex and confusing. Moreover, because the current structure that exists is neither defined nor supported by any government policy or legislation, it provides a difficult environment for integrating climate change considerations into urban development plans. The key Ministries and agencies that are directly involved in the management of climate change in Sierra Leone include the Ministry of Lands, Country Planning and the Environment (MLCP&E), the Sierra Leone Environmental Protection Agency (SLEPA), the Meteorological Department (MD), and the Climate Change Secretariat (CCS) (see Figure 15). At the time of this study, two of these institutions – the MLCP&E and the MD, were found to play very critical roles in climate change management. Whereas the former served as the national focal point to the Global Environmental Facility (GEF) for all environmental matters including climate change, the latter was Sierra Leone's focal point for the implementation of climate change. However, owing to the lack of clarity in their roles, all of these bodies have tended to assume leadership in addressing climate change, with the management process being highly fragmented among the various institutions. This complexity makes it very difficult to determine with any certainty the different levels of responsibility, since all the institutions operate at the central government level. Nevertheless, and as Figure 16 shows, it is assumed that since the SLEPA (formerly, the Environment Department, which has overriding responsibility for issues connected to the environment, and by implication, climate change) is supervised by the MLCP&E, it is

therefore, answerable to it. The actual roles performed by each of these institutions in addressing climate change will now be examined.



**Figure 15: The institutions responsible for climate change management in Sierra Leone**

#### **6.4.1 The Ministry of Lands, Country Planning and the Environment**

As was pointed out in Chapter Six, the MLCP&E is the highest authority for land administration, land use planning and environmental management in Sierra Leone. It is specifically concerned with physical planning, development control, the management of state lands, the control of surveys, the updating of maps, and the coordination and monitoring of all environmental policies and programmes. As the focal Ministry that oversees all urban planning and environmental management processes, it is in a prime position to promote intersectoral linkages and ensure the integration of climate change considerations into urban planning decisions and processes. A key difficulty however is that the three divisions (Planning, the Environment, and Lands and Surveys) which make up the Ministry have always tended to operate in isolation, with each divisional Head being very suspicious of the other. Even though all of these Heads are relatively new to their positions (less than two years) and are also very aware of the consequences that such

strained relationships among their predecessors have had on planning and environmental outcomes, they are rarely prepared to disengage from them. For example, all the divisional Heads are required to attend Climate Change Technical Committee meetings, which are presided over by the Head of the Environment Division; however, the other two Heads have rarely done so. Although each of the divisional Heads would not directly accept blame for this lack of cooperation, one reason that emerged was that divisional Heads preferred to abstain rather than support activities that would work to promote the profile of their colleagues. One of the divisional Heads, for instance, stated as follows:

*“I have no problem attending their own meetings if only I was invited. The problem is that even if you invite them, they will not attend because they would think that you either want to show off or that you want to be recognised as a more superior Head.”* (EP-PMS2, 2009)

As a result, it can be assumed that most of the policy-decisions that have evolved from this Ministry regarding planning, the environment or land use are likely to have been designed based on isolated decisions. This highlights how institutions based on sectoral divisions lock individual and organisational behaviours into a compliance mindset, with little consideration for creative solutions to existing problems (Mahalingam and Levitt, 2007). As Tenbrunsel *et al.* (1997) observe, because such compliance structures rarely reward creativity, since actors are merely required to follow rules, it is possible for some self-serving individuals to exploit them for their own self-interests. This emphasises the importance of establishing new relationships within the MLCP&E through institutional reforms that are based on the provision of positive incentives and rewards.

#### **6.4.2 The Sierra Leone Environmental Protection Agency**

Established in 2008 within the Ministry of Lands, Country Planning and the Environment, SLEPA is now the lead institution for all climate change issues in Sierra Leone. Its mandate results mainly from the overarching responsibility that it has over environmental protection and management in the country. The agency was established in response to the growing need for a more robust response to the country’s environmental problems, given the weak management capacity of the institutions that were hitherto charged with the responsibility. Prior to its establishment, responsibility for climate change was scattered among various government ministries and agencies, with the key agencies being the Meteorological Department and the MLCP&E. As climate change throughout this period

was construed mainly as an environmental issue in the country, the MLCP&E transferred its own responsibility for implementation to the National Commission for the Environment and Forestry<sup>8</sup> (NaCEF). However, the lack of clarity in its legal status led to its dissolution and replacement with the Sierra Leone Environmental Protection Agency (SLEPA).

SLEPA's key role is to proffer advice to the government in the formulation of all policies relating to the environment in addition to co-ordinating the roles and activities of the different actors. With overall responsibility for managing the environment, SLEPA is likely to succeed the MLCP&E as the focal point for all environmental issues in Sierra Leone. This implies that SLEPA will also serve as the main contact point for the UNDP and the GEF in dealing with climate change issues. Two key advantages of this link in the promotion of climate change relate to the overarching power that will be given to SLEPA to commission research about climate change issues and the power that it already has to issue environmental permits and pollution abatement notices. However, the ambiguity about how to organise SLEPA to carry out this role adequately and the poor enforcement processes currently existing, due largely to resource and human-capacity constraints, makes it difficult for SLEPA to fully exercise this mandate. This will be particularly critical for the future management of climate change, since it is SLEPA that has responsibility for overseeing the activities of the CCS in Sierra Leone. Already, its Executive Director chairs the Climate Change Technical Committee meeting, which consists of representatives from relevant environment-related line ministries and agencies.

#### **6.4.3 The Meteorological Department**

The MD is responsible for the forecasting of weather and the dissemination of information about weather and climate throughout Sierra Leone. Even though established within the Ministry of Transport and Communication (MOT), it has been very actively involved in climate change management, owing to its overriding responsibility for information about the weather and climate. Up to December 2009, when the field study phase of this research was concluded, this Department was the recognised national implementation agency for

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<sup>8</sup> This Commission was set up from the amalgamation of the Environment Division of the MLCP&E and the Forestry Division.

climate change, in spite of the existence of the CCS and SLEPA. As a result, it played host to the Climate Change Project by providing secretarial facilities to support the Technical Committee meetings. To contribute to this role therefore, the Department's Director was made the Deputy Coordinator of the project, since the Project Coordinator's role was full-time employment. Under its leadership, Sierra Leone has made several representations at a variety of international conferences and workshops on climate change. To date, there is no common repository for the various conference documents or of other related information that could increase understanding about climate change. Even the limited reports that have been produced from recent studies are in dire need of proper storage facilities and filing systems. As noted by Yohe (2001: 249-255), this inability to prudently manage information will challenge the country's ability to build capacity to address climate change. With the setting up of SLEPA, and the reconstitution of the CCS, it is yet to be seen whether this Department will continue to be the national focal point for climate change.

#### **6.4.4 The Climate Change Secretariat**

The CCS was set up in 2006 as part of Sierra Leone's commitment under the UNFCCC. The central aim for its establishment in spite of the existence of several other actors is to facilitate the implementation of the Kyoto Protocol and the UNFCCC convention. Its main responsibilities are to support climate change research, and to ensure the achievement of set goals and targets as part of the global effort to combat climate change. The purpose that it will have to serve along with the motivation that led to its creation was articulated by one respondent from the SLEPA Board:

*“When countries sign the Kyoto Protocol, there are certain institutional structures that are required to be set up to facilitate its implementation. One of these is the need to have some kind of body that will facilitate and implement the relevant provisions. Also, for countries to be clear for consideration for such Kyoto provisions as the Clean Development Mechanism, they need to have what is known as a designated national authority. As you can see, there is already a Climate Change Technical Committee which, together with this office, will continue to serve as our own designated National Authority.”* (CA-ACA1, 2009)

Since 2003, the secretariat has actively participated through its Project Coordinator in the preparation of the country's Initial National Communication report, and the National Adaptation Plan of Action. Zucker (1987: 446-448) emphasised that institutions create

expectations by establishing a compliance relationship between organisational behaviour and what is defined by the rules. By becoming a party to the UNFCCC, Sierra Leone has had to conform to these expectations, which it does through the CCS. The secretariat is currently carrying out Sierra Leone's Second National Communication study, including a series of other studies that it is conducting collaboratively with a range of other bodies. Even though lacking in human resources capacity in itself, the CCS periodically hosts training programmes with funding from the government and the UNDP/GEF. For example, just before the study for the Initial National Communication was commenced, various workshops were held through the aid of an international consultant to develop local capacity in such areas as GHG inventory, mitigation, vulnerability, and adaptation (Pratt, 2007). However because of its weak capacity, the Office's role has been limited mainly to overseeing the development of GHG inventories, along with assessing the impact that climate change will have on the various sectors of the country.

#### **6.4.5 Summary**

In summing up the lessons learned from the above analysis, it can be seen that in spite of the lack of a specified policy on climate change, Sierra Leone has an abundance of legislation that has either direct or indirect implications for climate change. Yet because several of these policies were designed even before climate change was framed as a problem in the country, they do not make any specific reference to it. This implies, therefore, that even though organisations may take actions to address climate change issues, there are no compliance pressures acting on them, since none of these rules specifically defines what actions are appropriate. Nonetheless, they each offer important opportunities to address GHG emissions and their impacts. These opportunities relate to the restraints that they pose to the uncontrolled use of the environment and the importance they attach to the integration of environmental considerations into national development plans. One important strand of thought that has permeated all these discourses is the strong emphasis they lay on protecting the environment. However, because these policies and plans focus mostly at the national level, they do not specify concrete activities at the local level where vulnerability is highest. The lack of an organised view about the 'environment' and 'planning' in the preparation of most of these plans, reflects the sectoral tendencies among the three divisions of the MLCP&E. Related to this is the discourse of apathy since, in spite of increased understanding of the adverse consequences that climate

change will impose on developing countries, such concerns were rarely referred to in the most recent 2008 SLEPA Act.

The analysis also shows that the institutional framework for climate change management in Sierra Leone has been complicated by the lack of a defined legislation that specifies institutional roles. As pointed out earlier, four main bodies have been at the forefront of the country's climate change management process. Because all of these bodies exist and operate at the national level, it has not been possible to involve actors at the local levels where vulnerability is high. Mukheibir and Ziervogel (2007: 145) had earlier observed this practice as a common feature of adaptation activities in many low income countries. Moreover, the strong sectoral tendencies of the three divisions of the MLCP&E may have led to the low consideration of planning issues in the preparation of national environmental policies and plans. It can additionally be highlighted that with SLEPA and the CCS slowly establishing themselves, a number of organizational issues that are still to be resolved in the future may help to clarify the different roles.

## **6.5 Climate Change Governance and the Proposed Structure for Integration**

Having examined the regulatory structures, laws and government agencies that define in an objective sense how climate change is addressed in Sierra Leone, this section will now examine two important issues which underpin the management process. These relate to the climate change governance process and the proposed institutional structure for integrating the relevant climate change concerns. By expanding the analysis to include some aspects of the country's disaster management process, it was also possible to recognize and bring out some of the apparent gaps between the two processes. The purpose of doing this is not only to make clear that such differences exist but, by drawing attention to the opposing institutional forces that influence uncertainty amongst actors, it is possible to identify ways to reduce such suspicions.

### **6.5.1 The governance of climate change**

The governance of climate change is achieved in the form of a Technical Committee (see Figure 16), comprising the membership of the Board of Agency for SLEPA. This body

was not specifically constituted for climate change issues, since its role spans generally across all the issues of environmental management. It was however assigned climate change governance issues based on the reasoning that no one institution alone can provide an adequate response to climate change. As membership of this group is drawn from across the many sectors that are either directly or indirectly involved with the environment, it was considered that with such a diversified membership, it would be easier to identify both the key climate change concerns for Sierra Leone and the policy actions to address the impacts. Nevertheless, in spite of the strong presence of several NGO's (both development and environment related) in Sierra Leone, their role within this committee has never been recognised. NGO's are undoubtedly very active in the promotion of advocacy, capacity building and networking in Sierra Leone. These, together with the many CBO's, as well as the private sector, have rarely been involved in climate change decision-making processes. The lack of access to the governance process by these various non-state actors confirms some of the leading criticisms about participatory processes, specifically, those relating to bias towards non-politically dominant groups and organisations.

In Freetown, one key observation concerned the noticeable absence of the FCC within this policy decision-making network. From the investigations carried out, it was found that all local councils in the country are represented on the Technical Committee, by the Ministry for Local Government. But while this Ministry is expected to disseminate important Committee decisions to local councils, it was learned that no such information is likely to be received by the FCC. As a result of this gap, the MLCP&E and the FCC have tended to duplicate one another's efforts in addressing the city environment, with most of the actions being heavily disjointed and disordered. One key problem to the effective implementation of decisions made at Technical Committee meetings is the lack of funds allocated by the line-ministries. Many also lack the appropriate human resource capacity to successfully make plans and implement environmental decisions. This is exacerbated by the exclusion from the governance framework of many of the people who are likely to be most affected by climate change.

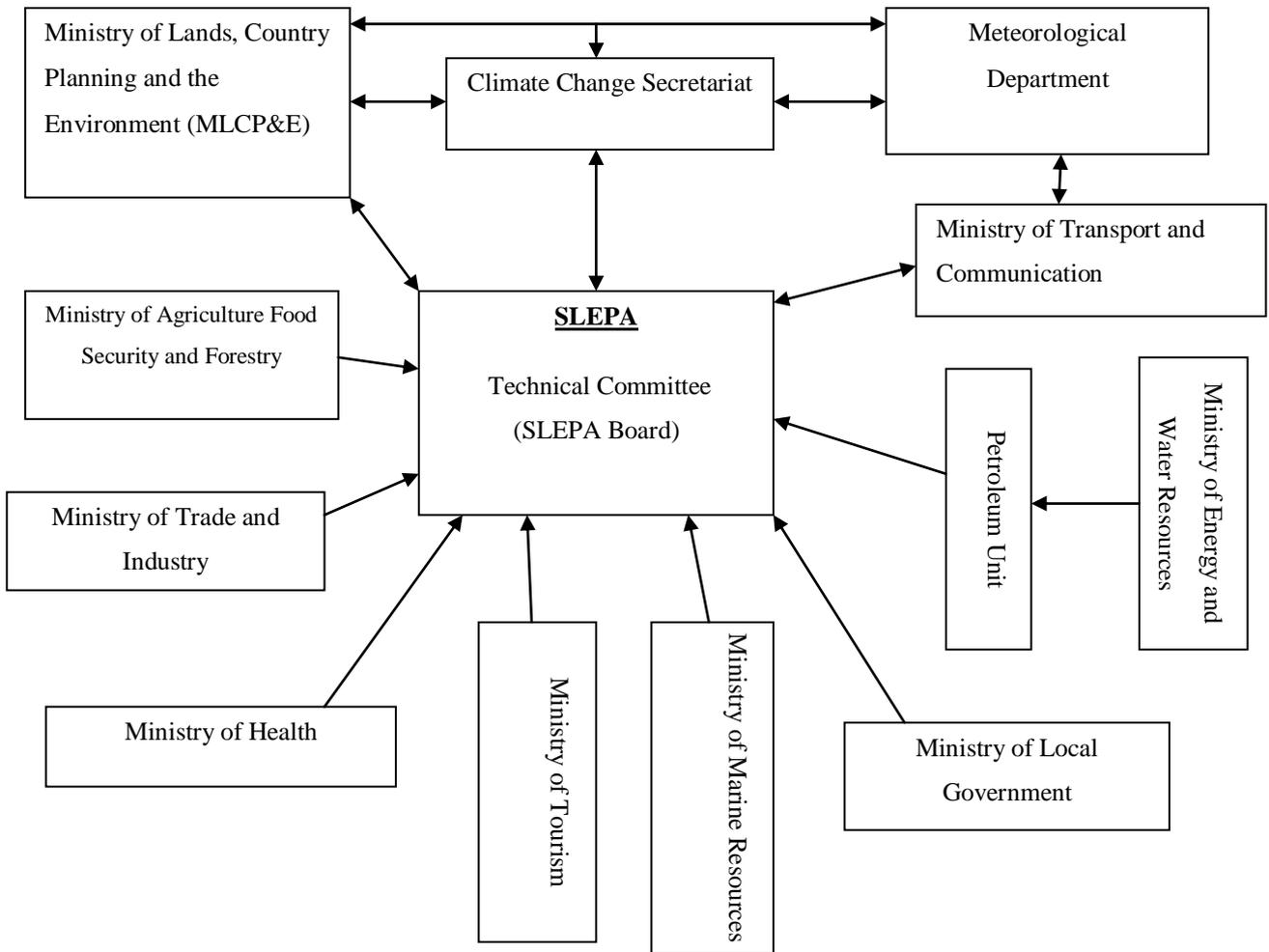


Figure 16: The Technical Committee (SLEPA Board) membership in Sierra Leone

### 6.5.2 The challenge of governance in tackling climate change

Whilst the SLEPA Act provides the institutional framework and also entrusts coordinating powers to the SLEPA Board for environmental protection and management, the actual activities to reduce climate change effects at the local level will be carried out by community residents. As has been variously emphasised, all the strategies specified in the country’s Initial National Communications and the National Adaptation Plan of Action (NAPA) tend to be mainly sectoral. This ignores such locally relevant issues relating to human livelihoods, access to resources, and entitlement which form the primary concerns of communities. Löfgreen (2000) points out that the way institutions are designed can determine ‘who’ actually participates. The IPCC (2001) have also indicated that because decisions to address climate change are made by only a few individuals or groups on behalf of society, they tend to privilege certain sets of interests above others. Adger (2003:

388) has similarly observed that people (often, the poor) whose interests may be better served by adaptation decisions are nevertheless usually left out in decision-making processes involving government adaptation interventions. The absence of such (community) voices on the Technical Committee where climate change policy-decisions are made may work to exacerbate the vulnerabilities faced at the local level. Moreover, because many of the strategies and actions in fact, overlap with several other initiatives of existing plans, there is the likelihood of confusion, duplication of roles and the wastage of scarce resources. One area of duplication relates to the fact that the Biological Diversity Strategy Action Plan (BSAP) and the NAPA each strongly specify the protection and management of forest reserves among their plans' key activities. This was found to be largely because most of these plans have been prepared without much consideration of other existing plans.

Another challenge is that because each of these conventions (UNFCCC and BSAP) has required separate national plans to implement them without much consideration of their relationships, it is doubtful whether the current capacity of SLEPA will be adequate to manage them. This will particularly have serious implications for the mainstreaming process since it requires the staff of the various line-ministries to undertake the integration roles which will be added to their normal duties. Thus, whilst it is clear that planning can play prominent roles in dealing with climate change, the additional burden which the integration process will create has rarely been addressed. Moreover, it was learnt that for many government officers, the interest in climate change is based more on the gains that they will have to accrue rather than on a genuine desire to tackle their effects. When expressing his concerns about this issue, one respondent from the project Secretariat stated that:

*“Most senior government officers that normally attend climate change conferences on behalf of the country merely do so because of the financial gains attached to it (per diem) and nothing more. It is regrettable that because of their positions (in the civil service and society), we dare not ask them about conference reports or about how they hope to utilise the knowledge.” (CA-CCP1, 2009)*

This raises serious doubts about the country's coping and management ability for climate change, since it is these same factors that constitute its adaptive capacity (Smit and Wandel, 2006: 286-287). With regard to these concerns, there were diverse views about the efficacy of either limiting the Secretariat's role solely to overseeing the mainstreaming

process so as to ensure its effective implementation; or to combine this role with others, such as overseeing projects and undertaking research. The question now is: how is climate change administered in Sierra Leone?

## **6.6 The Climate Change Project**

The administration of climate change in Sierra Leone was observed to be in the form of projects with support drawn from the GEF. These projects, which aim to enhance Sierra Leone's capacity to fulfil its obligations under the UNFCCC, involve a range of activities that are led by the CCS. Foremost among these activities is the periodic updating of the country's GHG emissions figures, in addition to specifying the kind of support that the country requires to mitigate, reduce vulnerabilities, and address its adaptation needs. Since 2003, when the first project was launched, only two projects have so far reached completion. These include the country's Initial National Communication, and the NAPA. The third, which relates to the Second National Communication, was initiated in 2009 and will last up to 2012. Although funding for these projects is requested by the Sierra Leone Government, they are actually accessed through the UNDP, which drives the country's climate change process. The UNDP is at the forefront of climate change actions in Sierra Leone because in addition to the country's inability to currently finance the different initiatives, it also lacks the required human resource capacities to lead the process. By way of the climate change project, therefore, it is expected that the UNDP should develop the relevant capacities within the national government so that it is able to undertake this role. This support provided by the UNDP and the influence it exerts in determining what (funded) activities take place is indicative of the way power is exercised by this organisation, through its taken-for-granted roles (Coaffee and Healey, 2003).

Because climate change issues are thought to be linked with meteorology, the Project Secretariat was initially located within the MD. However, with the establishment of a separate office for the Secretariat, it is uncertain whether the MD will continue to be the main implementing body. The National Coordinator of the Secretariat is recruited by the UNDP and in addition to managing projects, he oversees the day-to-day running of the office. His activities are supervised by the Climate Change Technical Committee which comprises of members of the SLEPA Board drawn from different government ministries and departments. The rationale for this broad supervision is to ensure wider acceptance of

project plans with a view to easing their eventual implementation. In the preparation of each project, the Secretariat works with various teams consisting mainly of stakeholders drawn from central government ministries, agencies and the university. However, because climate change activities are carried out on a project-by-project basis with each having defined time lines, once the project ends, every team member retreats to his or her respective institution. Thus, until there is another related project, such as is currently the case with the Second National Communication, no further actions on climate change will take place. One respondent from these teams stated as follows:

*“Developmental activities here are generally project-led with defined timelines. Once the lifespan has expired, it seems as though the project also ends. Hence, there is always this big gap in terms of continuity. This is particularly serious because of the difficulty for our kinds of governments here. You see, it is normally difficult for them to take independent initiatives to address issues like climate change all by themselves or to even implement the result of these projects without being pressured or assisted by an external body.” (CG-DPCI, 2009)*

One implication of this project-by-project approach is that once a project ends, both the awareness and momentum of the public slowly weakens. It was therefore common for many people to suggest the need to set up a more permanent secretariat, with a clear national strategy for dealing with the impacts. This will be particularly critical in meeting the UNDP’s expectation that by the end of the Second National Communication (in 2012), Sierra Leone will have developed adequate capacity to commence the integration of climate change into ministerial action plans. Nevertheless, as actions to address climate change are in general a process, the government and the UNDP are still trying to develop appropriate structures to enable this process. This raises the question – what type of structure would be needed to facilitate the climate change integration process?

## **6.7 Proposed Framework for Planned Integration of Climate Change**

As has already been emphasised, Sierra Leone has not yet commenced actions to integrate climate change concerns into its planning decisions and processes. However, it has been proposed that this process should commence immediately after the Second National Communications study is completed. Although the integration activities will be carried out by the respective government ministries and departments, it is the CCS that will be the

main coordinating body. While a number of concerns have been voiced regarding the capacity of the Secretariat to effectively manage this process, it is nevertheless considered that the setting up of any new structure may lead to further complications of roles. This view, which is shared by the UNDP office, was expressed by one of its staff as follows:

*“It should not be a question of whether or not the Secretariat has capacity or there is need for another structure. The Secretariat’s role will be merely to pilot the projects and to undertake periodic monitoring and evaluation of projects. It is the responsible ministries and departments themselves that will have to carry out the integration process. For this reason, we will have to provide funds and build capacity.”* (SL-DON2, 2009)

In spite of this strong conviction and the assumption that government ministries are already well-positioned to undertake the integration process, there are still numerous doubts about whether the government officials are in fact, enthusiastic about it. As was earlier stated, several officials considered themselves to be already overburdened with their current tasks and are unwilling to accept any added responsibilities that do not bring about a corresponding rise in their earnings. This is exemplified by the fact that there is a tendency for officials to expect to be recompensed whenever they attend the capacity-building and skills-training workshops organised by the UNDP. It is not that they are oblivious of the worth of the training, but because of the generally poor conditions of public sector jobs, many are unwilling to opt for additional tasks.

Another complexity that the integration process currently presents is the fact that the mandate of the Project Coordinator (Head of Secretariat) basically stops at providing the country with the Second National Communication. This implies that once the current project ends, the Project Coordinator’s contract with the Secretariat also expires. This “single problem-single solution” approach (OECD, 1996: 51-52) which reflects one of the ways power is exercised by the UNDP, has tended to undermine some of the gains made by the country in raising awareness about climate change. This is worsened by the fact that the administrative machinery (CCS) for managing the integration process is yet to be properly streamlined. Thus, even though government ministries and departments would be required to integrate even without a functional Secretariat, it is difficult to imagine how valuable the outcomes would actually be. In exploring the wider implications these governance issues will have on disaster occurrences in Freetown, this study will now examine the relations that exist between climate change management processes and disaster risk reduction.

## 6.8 The Institutional Relationship between Climate Change and Disaster Risk Management

The Disaster Management Department (DMD) is the focal point for the coordination of all response to national emergencies (both natural and man-made) in Sierra Leone. It was established specifically to manage all national emergencies relating to disaster prevention, mitigation, preparedness, and response. Its establishment in 2004 within the Office of National Security (ONS) was in response to the proliferation of disaster events in the country which were seen mainly as threats to national security. Over the years, the Department has developed a National Disaster Management Policy along with such other documents as the National Disaster Preparedness and Response Plan. All these instruments, along with the National Hazard Profile which it has recently completed, have been developed in an attempt to support its activities. The department sets out its policies in line with the Hyogo Framework of Action (International Strategy for Disaster Reduction) which emphasises a focus on hazard prevention. In recent years, it has strongly promoted hazard prevention in an attempt to minimise the effects that disaster occurrences can have on the country. However, in spite of the strong relationship that exists between disaster management and climate change issues, each has been pursued in isolation. For example, whilst each domain devotes a great deal of attention to vulnerability issues because of their propensity to exacerbate (hazard) risks, there has rarely been any collaboration across the domains. This is in spite of the support that both disaster management and climate change processes have from the UNDP, which has been actively involved in their development.

In the case of cities, this isolated approach to dealing with problems has been put into question in various ways (Qureshi et al., 2009; Friedmann, 2005; Andersen and Van Kempen, 2003) because of its tendency to deepen vulnerability. Qureshi *et al.* have, for instance, emphasised that because urban problems are generally complex, any solution to one must be based on an evaluation of its relative implications for the other, or for the wider city. In Freetown, such considerations have rarely been taken into account in the management of both climate change and disaster-related concerns. Nevertheless, it was interesting to find that certain senior personnel of the two offices were strongly aware of the synergetic gains that could be achieved through working together. One manager, for instance, expressed a desire to establish contact with their counterpart agency as follows:

*“I was thinking we sit together with them and maybe discuss how we can strengthen the relationship between the two institutions. I think we have only met like two-three weeks ago for the very first time because we were trying to do a paper for this Copenhagen Meeting. But it surely needs to be improved upon because we have always been seeing ourselves as two independent organisations which should not be the way to go.” (CG-NCP2, 2009)*

From the above statement, it can be seen that whilst actors may not have been in accord with some of their own behaviour, it may not have been their own choice but due to the way that organisations embed their practices in a range of rules, values, norms and laws which define the expected behaviour of actors (Hall and Soskice, 2001). Since institutions can also enable particular styles of behaviour, it is possible to reverse such negative sanctions and rules through reforms and by the use of rewards and positive incentives (Campbell, 2007: 958).

## **6.9 Summary**

The above analysis has shown that the governance of climate change is fraught with great difficulty because the decision-making process seems to converge around a selected and limited set (Technical Committee) of people, who make decisions outside local-level representations. These include the FCC, the private sector, and several national NGOs which, even though very actively involved in many of the developmental and environmental activities at the local level, are rarely accorded space in discussions about climate change. The exclusion of these important bodies from decision-making processes has created a huge gap between national level activities and local level realities. This gap will potentially be reinforced by the sectoral framing of the country’s adaptation activities, in the way that the latter do not fully reflect the primary concerns of the communities.

It has in particular been shown that the various climate change activities carried out by the government have generally been designed in the form of projects which are motivated by the UNDP/GEF/UNFCCC. Several of these activities have been carried out mainly to fulfil Sierra Leone’s obligations under the UNFCCC. As a result of this, they may not have been designed based on national priorities. A key problem with this approach is that once a project expires, the drive to deal with climate change also falls off, until another project gets going. It is also emphasised that actions to integrate climate change into planning processes have not yet started in Sierra Leone. While the CCS is the designated body that

will have to oversee the integration process, it is the MLCP&E and the various other ministries and agencies that will have to carry out the integration process. This will potentially be faced with difficulties since without additional reward, officials may not be incentivised to commit to it. It is observed here that while city-dwellers are largely concerned about the prevalence of vulnerabilities and risks in their communities, none of the national responses have so far made this their focus. What is surprising is that in spite of deriving support from the same source (the UNDP), the CCS and the Disaster Management Office do not collaborate on disaster-related issues. This may tend to aggravate maladaptation, given the level of disjointedness that is likely to emerge when climate change responses eventually get underway.

## **6.10 Assessing Capacity in the Management of Climate Change**

This section examines the prevalent gap in the capacity of the key institutions that manage climate change in Sierra Leone. As highlighted in the NAPA report, Sierra Leone requires urgent support in many areas to enable her to respond to the potential impacts of climate change. This is mainly because of the existing gap in the capacities of the different institutions that already have responsibility for managing climate change. This section specifically looks at the capacity constraints in generating weather and climate data, including the challenge of making climate change issues an integral part of urban planning decisions and processes. The data will be analysed by themes rather than by institutions, as this helps to provide a better understanding of the key capacity concerns that cut across the different institutions examined. Even though planning is not the major concern here, references will be made whenever deemed appropriate.

### **6.10.1 Policy-related capacity**

As has been variously highlighted, Sierra Leone does not have specific legislation or policy to address the negative effects of climate change. Most of the regulations and policies applied, relating mainly to environmental management, deforestation and urban planning, are generally weak because their prescriptions and management practices are almost out of touch with the country's current development challenges. They do not therefore provide the required platform to support the climate change integration process.

Moreover, even though some aspects of this legislation have been applied to a number of mitigation and adaptation issues, they do not refer directly to climate change. What is also surprising, is that even the SLEPA Act (2008), which is the country's leading legislative instrument for environmental protection, does not make any specific reference to climate change. For that reason, the notion that climate change issues have been legislated for in Sierra Leone can be seen to be something of an assumption. Also, because Sierra Leone's TCPA (1946) predates the emergence of climate change discourses, it does not specifically require planners to consider climate change issues in planning decisions. This apparent gap between urban planning and responses to climate change therefore necessitates the enactment of new policies and legislation that will specifically focus on accentuating the latter in urban planning decisions.

The need for such policies and laws is because of their important role in defining what actions are appropriate for individuals and organisations. They also establish a compliance relationship between individuals, organisations and the law. Some scholars have argued that the lack of adequate regulatory structures (laws, rules, policies) can complicate organisational roles. This has been the case with Sierra Leone, where the absence of a clear legislative structure with defined management systems has led to various organisations assuming leadership for climate change. Yet, whilst it is necessary to have regulatory structures, it is important not to make them overly restrictive as this will reduce organisational room for manoeuvre (de Soto, 2003). Reform is also important in streamlining some sectoral legislation relating to some ministries and agencies whose laws have been developed without adequate consideration of other existing laws. The need for the FCC to have a legislative mandate over the management of the Freetown environment is similarly critical in promoting locally-oriented responses to development in the city.

### **6.10.2 Organisational capacity**

Until 2008, when it was transformed into the SLEPA, the Environment Division of the MLCP&E had relatively fewer responsibilities, despite having authority for the governance of climate change. Thus, it did not require a large management set-up for environmental protection, since the responsibility for responses to climate change was already shared by the MD and the CCS. With the transformation of this unit into SLEPA and the resultant transfer to it of all environmental roles, however, its organisational

capacity was far exceeded. This was in part because for several months after its creation, no new recruitment occurred beyond the seven officials of the Environment Division who transferred jointly with its creation. As with the SLEPA, the CCS was deficient in several regards. These relate mainly to its limited expertise with regard to effectively coordinating the assessment of the country's GHG emissions, and its lack of capacity to evaluate how the different sectors of government will be affected by climate change (Pratt, 2007: 140). The Secretariat also lacked adequate capacity to assess the country's mitigation and adaptation options.

Additionally, the MD, which produces all weather and climate data for Sierra Leone, is significantly under-staffed, with several of its skilled staff having left owing largely to poor salaries and appalling conditions of service. With less than 25 officials, the MD now operates only 7 out of the 15 national weather stations that existed prior to the war. Most stations are yet to be restored owing to the immense maintenance costs required, since many had undergone severe war damage. With regard to climate change, a major gap in understanding the country's climate trajectory is the lack of historical climate data for many stations. The only available data that is viewed as plausible and that has been referred to in the assessment of the country's climate change status relates to the period from 1960 to 1990. Much of the data prior to this period has become inaccessible through deterioration due to poor storage facilities and war damage. Other factors relate to the non-collection of data and the lack of appropriate weather-recording equipment. As was emphasised in the Initial National Communication Report, the main drawback of this deficit in meteorological equipment will be the constraint that it poses on the availability of valuable and accurate data with which to model and simulate climate scenarios for the country:

*The present status of the network stations of Sierra Leone will not contribute meaningfully to the future of data for national, regional and global climate initiatives. It is thus a priority in Sierra Leone to reverse this deterioration of the observation networks and improve the data and information. Improvement will entail acquisition of automatic recording equipment and expansion of networks to get more representative coverage of the country. (Pratt, 2007).*

As with urban planning, the non-inclusion of climate change as a separate subject in the curricula of the country's two universities may have led to a marked deficit in skilled staff. Nevertheless, it has emerged that efforts are now underway to introduce each of these areas as specific fields of study in one of the universities. One main difficulty, however, is

that because very little effort has been made by the government to ensure community and private sector participation with regard to climate change, their role has been very limited, with hardly any capacity to actively engage them in the management of climate-related issues. This limitation makes it difficult for any public-private partnering on climate change or for the outsourcing of some specific climate change-response tasks to these sectors.

### **6.10.3 Technical capacity**

Under the auspices of the UNDP, the CCS has organised various training sessions aimed at building capacity for climate change. Training is usually delivered by international consultants hired by the UNDP, with funds provided under the GOSL/GEF/UNDP project. The specific areas of focus for these sessions have been the setting up of GHG emissions inventories; the assessment of GHG mitigation options; vulnerability assessment; adaptation assessment; and techniques for screening and simulating climate data. However, because each of these sessions was held only once, and for a limited set of persons, it is important that further training is provided in these areas. Other areas of technical support from the GEF relate to the nation-wide climate change capacity needs assessment that was carried out in 2005. As this assessment merely focused on identifying the specific capacity building needs that will help Sierra Leone fulfil its mandate under the Kyoto convention, it did not concern itself with the actual problems faced at the local level. Therefore, it is important that capacity needs assessment that accentuates the actual concerns of people in their local areas be undertaken.

Similarly, it was observed that the European Commission (EC) in Sierra Leone has, since 2008, been actively involved with the provision of technical support to build capacity for urban planning in both the FCC and the MLCP&E. The support, which focuses broadly on improving the living conditions of Freetown, has the development of a Freetown Development Plan as its main objective. A diagnostic study which forms the basis of this plan was completed in 2008. One key challenge however, relates to the lack of capacity (human, resources and legal) within these two organisations for the effective implementation of plans. While at the national level, there exists a Planning Ministry, albeit one that is heavily under-resourced with very few trained and skilled staff, there is no such unit at the municipal level. An important issue, which reflects one of the key

findings in the EC's diagnostic report, is the absence of a clear register of property titles for Freetown regarding the way its land space is organised. This finding is particularly important because most of the city's planning processes have taken place without recourse to any available database information on land entitlement or regarding how the land space is generally managed. Another finding is the lack of a clear urban policy and strategy for Freetown that clarifies the competencies and roles of the various departments and bodies engaged in the planning process.

#### **6.10.4 Resource capacity**

Another observation is that nearly all the institutions responsible for climate change lack the resources required to deal effectively with its effects. Since 2002, when it began to be more recognised as a problem in Sierra Leone, climate change has always been viewed as an environmental issue. Yet in spite of the low government funding for this sector, only a few donor agencies (the EC, UNDP, and the FAO) in the country have actively shown an interest in its development. In the area of resource capacity, very little has been done to empower individual and organisational roles in Sierra Leone. In Freetown, where most of what little assistance exists has been provided to organisations, the main support has been in terms of computers and related equipment (software and hardware). These items have been procured mainly through GEF-funded projects under the supervision of the UNDP.

Although a number of NGOs with a large funding outlay are involved with the environment, they are not actively involved in providing capacity for climate change. This is partly because of their non-inclusion in decision making processes regarding climate change. Some NGOs, however, provide training to communities and households on how to deal with hazards. Whilst NGO interventions ought to be guided and coordinated by central government, to avoid crowding or duplication of roles, it seems that many do not want to be coordinated, since they wish to have command over their own funds. As part of its coordinating role, NGOs are also required to inform the FCC (by letter) about any intervention that they wish to make in any part of the Freetown municipality. This requirement has usually been flouted, and many interventions take place without the knowledge of the FCC. Several NGOs refuse to give prior notice to the FCC about their interventions because of the risk that the FCC – which they accuse of hardly intervening in communities to undertake development activities on its own – will capture their initiatives.

### **6.10.5 Summary and Conclusion**

This chapter has discussed some of the main challenges involved in addressing climate change concerns in Sierra Leone. It has particularly identified as one of the key impediments to addressing climate change in Sierra Leone, the lack of specific policy and legislation on climate change that clearly specify institutional roles and a defined national strategy for tackling climate change issues. The resulting ambiguity in organisational roles has usually served as both a source of conflict (with the MLCP&E, MD, SLEPA and CCS each assuming leadership for climate change) and of exclusion (of other organisations – FCC, NGOs and CBOs by more powerful organisations). This has caused difficulty in the governance process, with climate change decisions about Sierra Leone being made without local-level participation. As funding for climate change activities in Sierra Leone has been provided by the UNDP/GEF/UNFCCC, most of the national responses have tended to be tailored largely to meet Sierra Leone's requirements under the UNFCCC. Such local level priorities as reducing the widespread vulnerability of Freetown have rarely attracted attention in climate change decisions. One main observation about the UNDP/GEF/UNFCCC's project-based approach to the provision of funding is its tendency to vitiate the impetus to address climate change once a project ends, since it takes time (sometimes up to a year) for another project to get up and running. While many scholars tend to hold certain assumptions about the existence in cities of the capacity to address climate change, a range of capacity problems have been observed in Freetown (and by extension, Sierra Leone) which present barriers to making climate change issues an integral part of planning. These constraints have been extensively discussed in Section 6.10.

## Chapter Seven

### The State of Planning Institutions in Sierra Leone

#### 7.1 Introduction

Much of the information used in this chapter is based on interviews and documentary reviews. Documentary reviews based on internet searches were necessary because of the difficulties faced in accessing some of the pertinent documents used in planning decisions in Sierra Leone. The constraints faced in this part of the research have been discussed in Section 4.8. This chapter briefly discuss the origin of urban planning in Sierra Leone and presents the evidence gathered in an attempt to provide answers to the third research question: Do planning institutions in Sierra Leone, in their present state, provide the right context for integrating climate change issues? It proceeds with a general overview of the country's planning laws, to set the context for examining how the different planning processes have created a difficult context in which to attempt to integrate the relevant climate change concerns. Prior to highlighting the key constraints faced by planning, the chapter discusses how decades of planning inadequacies due to lack of capacity have increased the vulnerability of many locales, meaning that Freetown is now highly susceptible to climate change impacts. In providing answers to the above research questions, four sub-research questions were analysed as follows:

- (i) How has the planning system in Sierra Leone influenced the development of Freetown?
- (ii) How does the legislative and institutional framework for planning support capacity to tackle the concerns associated with climate change?
- (iii) Which planning policies and procedures have had the most impact on the development of Freetown and what are the implications of this for climate change?
- (iv) What are the main planning challenges for integrating climate change?

It should be noted that, because each of these sub-questions focuses on a specific aspect of the third research question, the analysis will bring together an understanding of the responses, in order to provide an answer to the main question.

## 7.2 The Origin of Planning in Sierra Leone

Urban planning in Sierra Leone is largely based on a UK-style planning system and was introduced from Britain at the end of the 19<sup>th</sup> century. It commenced with the establishment of the Freetown City Council (FCC) in 1893 and the enactment of the City Improvement Act of 1900. Prior to this, development in Sierra Leone was largely unplanned, with several areas of the country being traditionally 'ordered' by local rulers. Its introduction therefore marked a major turning point in terms of how living conditions in the country were intended to be organised. Initial concerns about planning in Sierra Leone focused specifically on improving Freetown. This approach clearly reflected the prevailing philosophies of the British planning system, which were based largely on the logic that urban problems were to be addressed primarily at the urban scale (Hall, 2002: 55). Thus, planning was introduced at the urban scale in Sierra Leone specifically to deal with the existing problems of sanitation and overcrowding that were the direct consequence of the rapid urbanisation of Freetown. As planning responsibilities were at the time entrusted with the FCC, the City Improvement Act was therefore intended to enable the city administrators to ensure an easier resolution of the problems through the application of its enforcement provisions.

However, the continuing population pressures on Freetown undoubtedly overwhelmed the capacity of the FCC to effectively enforce this Act since there was no prior system for dealing with it (Howard, 2003). This was compounded by the strained relationship between the FCC and the colonial administration, given that the latter did not allow the FCC overall control over the city's development process (Wyse, 1987). Thus, even though the enforcement of standards in planning and public health were at the heart of the City Improvement Act, these factors did not facilitate its effective implementation (Doherty, 1985: 153-154). Hougham (1981: 528-529) has shown that until the commencement of the Colonial Development and Welfare Plan in the 1940s, most colonial administrators lacked knowledge about planning issues, and had little understanding about how to act with regard to them. As a result of this, comprehensive approaches to planning did not become a regular feature of planning in Sierra Leone until the 1940s.

## **7.3 The Introduction of a Comprehensive Planning System in Sierra Leone**

The emergence of a more comprehensive form of planning in Sierra Leone coincided with a new planning logic which held that planning is more effective when it goes beyond the urban scale (Hall, 2002: 55). Unsurprisingly therefore, the period commencing the 1940s witnessed the ushering in of two different forms of planning in the country, which relate mainly to National Development Planning (which reflected this new idea of planning at the national scale) and Land use Planning (which still had land uses as its main focus). Even though these types of planning differed from one another in many ways, they have each had a profound influence on the way development has taken place in Freetown, based largely on the various sets of policies each has initiated. For instance, while land use planning as depicted by the 1946 Town and Country Planning Act (TCPA) has generally symbolised a move towards a more ‘plan-led’ system of physical development, development planning has signified the distribution of resources specifically for the development of regional centres as well as towns. Thus in reviewing how far planning systems in Sierra Leone have evolved, it is necessary to begin by examining the two forms of planning separately, in order to determine how far they have evolved over time, including the influences they have had on the development process in Freetown. The land use planning system will be reviewed first and after that, the National Development Planning system. With regard to the latter, two different periods of plan development are reviewed here. These relate to the pre-independence period and the post-independence period.

### **7.3.1 The Land use Planning System**

Land use planning was introduced in Sierra Leone at exactly the same time that the country’s first ever NDP was unveiled. Before this time, the only notable planning instrument that was used to address physical planning issues was the City Improvement Act of 1900. Although extensively used to address physical and spatial problems in Freetown, the City Improvement Act was in fact flawed. This is in part because aside from its limited focus on enforcing housing and sanitation rules in Freetown alone, it was in reality far too narrow in scope, since it was not actually designed specifically as a physical planning document (Doherty, 1985). Accordingly, the introduction of land use planning

(as represented by the TCPA) was considered appropriate, specifically as a means of enforcing control over the unregulated growth of settlements by ensuring that a more comprehensive system of land use planning was developed. This was to be based on the design of physical plans for each urban area, in ways that would clearly specify the desired future end state for the town or city, with details of how the differing land spaces were to be used. The significance of this kind of physical plan was primarily the measure of control it wielded over land uses. This was seen as critical in reconciling the different development activities taking place within settlements and for reducing the problems associated with rapid urbanisation.

Because this formulation coincided with a major policy shift to a deliberate prioritisation of development in the new provincial towns, this system of planning was therefore perceived to be well-placed to ensure that, similarly, to Freetown, all land uses in the emergent towns were effectively controlled. Even in Freetown, effective land controls were undoubtedly seen as critical in averting the pervasive problems of uncontrolled development and sanitation and, in ensuring that any new development took place within the authorised development plan. However, unlike the NDP's which were subjected to periodic reviews, the substance of the 1946 TCPA has rarely been reviewed. Because this Act is still the foremost Town and Country planning legislation in the country, it seems reasonable to argue from the onset that the planning law of Sierra Leone is not sufficiently robust and germane to address the range of challenges that climate change will present to the country.

### **7.3.2 Overview of the Land use Planning-Environment interactions**

In Sierra Leone, concerns about environmental degradation, which has evolved into climate change discourse, dates far back to the early 20th century when the British colonial government started a series of investigations into the state of Sierra Leone's forest (Munro, 2009). This was also the time when the design of some of the country's earliest laws and policies relating to the environment were started. Yet, because most of the laws throughout this period were conceived mainly in terms of forestry management (Leach, 1994), it was difficult to develop a systematic understanding about how man's activities affect all the other components of the natural environment. Although the 1900 City Improvement Act was designed to focus on such issues as congestion, overcrowding and sanitation problems

in Freetown (Doherty, 1985), these were rarely seen as environmental issues, being used merely to denote the inadequate living conditions of some citizens. The limited framing of the environment in terms of forestry management issues and the sectoral approaches used to address it (following the setting up of a Forestry Department in 1912) have presented a difficult basis on which to mobilise environmental awareness for urban planning decisions. This difficulty has arisen mainly because of historical issues in the design of these laws, since the country's planning law (1946 TCPA) was created long after several of the laws on forest management were enacted.

One main problem with the 1946 TCPA is that it does not provide planners with any specific mandate to incorporate environmental issues into urban planning decisions. Thus, for a very long time, urban planning and environmental management in Freetown have been carried out as unrelated processes. It was only in 2002 when an Environment Department was created within the country's Planning Ministry, that an organised approach to the environment became feasible. This process was to be supported through the use of a range of environmental legislation and plans that were developed in the country following the launch of the 1987 Brundtland Report. However, because the country's planning legislation predated all of these (later) laws and since Sierra Leone's planning law was never revised to accommodate these changes, the policy and legislative divide between the environment and planning has persisted to date. While these policies and laws have continued to be separately applied, the persistence of worsening living conditions in Freetown are indicative of the lack of success by governments at promoting urban sustainable development. The lack of a broad and far-sighted perspective on Freetown in terms of the environmental implications of its development, along with inappropriate planning controls over the use of land, have made the city's development process very problematic. In many areas, this is exacerbated by the rise in levels of overcrowding, as well as the spread of unplanned development.

The next sub-section will now review Sierra Leone's NDPs, starting from the pre-independence period.

### **7.3.3 The Pre-Independence National Development Plans**

NDPs within this period were specifically oriented towards economic planning, with the central aim of positively discriminating development activities in support of economically

depressed regions in the provinces. This was in an attempt to correct the widening imbalances that had occurred between Freetown and the provinces since, unlike the land use plans, very little had been consciously done to improve the living conditions of the people. Two main development plans were implemented during this period. These included the First National Development Plan (FNDP) (introduced in 1946) which sought to reduce the widening inequalities between Freetown and the provinces with the implicit aim to reduce population pressures and the unsanitary conditions in Freetown, and; the Second National Development Plan (SNDP) (introduced in 1960) which, similar to the former, also focused on diverting population away from Freetown. This was to be achieved through a deliberate shift in the focus of development away from Freetown in support of the provincial settlements (towns and villages). The SNDP in particular focused more on infrastructural development in the form of grandiose investments in the provincial roads. The initial focus was to promote agricultural development with a view to modifying the living conditions of rural settlements in relation to their urban counterparts. This was to be ensured by improving livelihood systems in such areas in an attempt to prevent the increased movement of people to urban settlements.

However, just under a decade of its implementation, the focus of the plan changed towards industrial development (Import Substituting Industries - ISI). The significance of this shift was the reversal of attention from an exclusive prioritisation of provincial areas for infrastructural development to the inclusion of Freetown and the Western Area (Gwebu, 1979: 100). Yet, the lack of appropriate skills essential for the kinds of industrial activities that were needed in the provincial towns made industrial investment in such areas problematic. For that reason, not much was achieved in attracting development and populations away from Freetown. As businesses have continued to concentrate in Freetown, population growth has also continued to rise. A notable consequence of this growth is the pervasiveness of unplanned development and the uncontrolled utilisation of the city's natural resources.

#### **7.4 The Post-independence National Development Plan**

Even though Sierra Leone gained independence in 1961, it was not until the early 1970s that a new national development plan was introduced. This was when it became evident that many of the earlier expectations of the ISI strategy were unlikely to be met (Standard

Times Press News, 2010). Three successive plans spanning this period, each reflecting different socio-economic circumstances in the country's history, will be examined as follows:

#### **7.4.1 The First Post-Independence National Development Plan (1974-1979)**

This plan represents the first 'locally' created NDP that post-independence Sierra Leone envisaged for itself. Even though similar in many ways to its immediate predecessor, this plan differed substantially in its unwavering support for agricultural development in the country. Agricultural development was prioritised because unlike ISI, it was seen as the most appropriate strategy for spatially redistributing income (Logan, 1990). This was an attempt to soothe the unfolding resentments that had cropped up over the unbalanced growth that had persisted between Freetown and its provincial areas. An important aspect of this plan was the highlighting of environmental degradation issues as a major consideration in the various forms of agricultural development projects that were to be carried out. In particular, the plan recognised that if Sierra Leone were to attain a sound economic development, the available natural resources would need to be used prudently. This was seen to be very critical in averting extensive damage to the country's ecological systems. Regrettably however, many of these concerns were not heeded in the implementation of the projects.

#### **7.4.2 The Pre-war National Development Plan and the issue of structural adjustment**

As the effects of the global economic crisis of the late 1970s and early 1980s became palpable in Sierra Leone, the government annulled the introduction of any new NDP. Instead, the country began a difficult period of macroeconomic reform in 1989, barely two years before the decade-long civil war. According to the International Monetary Fund (IMF) and its ancillary, the World Bank, Sierra Leone needed to undertake a series of policy and institutional reforms to enable it deal with its chronic and precarious economic problems. This was because of the enormous debt that it had incurred based on the massive infrastructural developments that it had undertaken just after gaining independence. This crisis was worsened by the reversion of trade, as the country's economy plunged from

being a key exporter of tradable products to a major importer of nearly all products required internally.

Although most of the economic reforms in the country actually occurred when the civil war was at an intense point, the adjustment process did not take any consideration of non-economic aspects. One major consequence of this was the worsening of poverty, as living conditions deteriorated throughout Sierra Leone. The exacerbation of poverty was largely the result of public sector retrenchment in the form of subsidy removals on essential products, mass redundancies from public services, currency devaluation and high inflation (Zack-Williams, 1990:29). In Freetown, these worsening living conditions were reinforced by the large flow of the rural population to the capital, which was perceived to be more secure, both in terms of physical security and with regard to human livelihoods. With this flow emerged the intensification of such problems as overcrowding and the expansion of squatters. As government cut-backs on public spending were also stepped up, the quality and accessibility of urban services and infrastructure declined considerably.

#### **7.4.3 The Post-war National Plans and the issue of poverty reduction**

When it became obvious in the late 1990s that poverty had intensified as a result of the harsh implementation of the Structural Adjustment Programme (SAP), a renewed version of development planning was introduced in the form of the 'Vision 2025' document of 2003. Unlike the earlier development plans, Vision 2025 actually focused on widening the development process by making it more consultative and flexible. This was based on the prevailing logic that in order to make development more successful, it has to be made more "comprehensive, cohesive and visionary" (Sierra Leone Vision 2025). Despite its valuable insights, this plan was itself very short lived. However, one of its medium-term strategies – the Poverty Reduction Strategy Paper (PRSP) – has now emerged as the country's leading development strategy (OECD, 2008; Government of Sierra Leone, 2006). The focus on PRSP is in response to the astonishing levels of poverty and vulnerability that resulted from the war. Indeed, poverty was bound to be high because in addition to the disruptions caused by the war, there was virtually no consideration of the social consequences that the SAP imposed on the people. The first PRSP was implemented from 2005 to 2007 while the second, otherwise referred to as the 'Agenda for Change'; commenced in 2008 with a four-year life-span. As the Standard Times Press News (2010)

observed, a major feature of these development initiatives was their overwhelming orientation towards Western ideas, in spite of the consultation processes that preceded the formulation of some of them.

#### **7.4.4 Summary**

This section has shown that planning in Sierra Leone has been based on two distinctive approaches with each having implications for the planning and development of Freetown. It highlights further that climate change in Sierra Leone is considered primarily as an environmental issue. However, owing to the dominance of sectoral decision-making processes in the country, it has been difficult to make climate change considerations an integral part of land use planning processes. This is partly because of the narrow way in which the environment was first conceptualised in Sierra Leone (that is, in terms of forest conservation) which has made it difficult for the planning profession to develop a holistic understanding of what the concept (environment) actually implies. The chapter adduces further that some historical issues have coloured the relationship between the country's planning laws and the environmental legislation that was enacted after the Brundtland Report. It emphasises in particular that, whilst it was possible to mobilise the idea of environment in planning processes after the setting up of an Environment Department within the MLCP&E, it was difficult to do so in practice because collaboration was never given priority.

The section shows moreover that for a very long time, development and planning in Freetown has been strongly influenced by two inter-related but wavering policy decisions at the national level. These relate to questions such as whether Freetown should be prioritised for industrial development, ignoring concerns about population pressures and their attendant vices (sanitation, overcrowding, health); or whether growth should be encouraged in other parts of the country, in the process reducing population pressures on Freetown. This question is directly related to a second one, that is, whether promoting the industrial sector in Sierra Leone is a better strategy for redistributing both income and population across the country or whether agricultural promotion through modernising the agricultural sector is a better strategy. Admittedly, it is not possible to arrive at any decisive answer to these questions since the information used here was largely obtained from documentary reviews. What is clear however is that these questions have continued

to dominate Sierra Leone's development-policy decisions to date. Moreover, because plans in the earlier post-independence period were implemented alongside the promotion of infrastructural development (as a way to lure private sector development), this created a difficult financial climate that led to the introduction of stringent SAP measures. This has had severe consequences for planning and development throughout Sierra Leone, owing to the limited resources that might be available for improving the deteriorating condition of settlements. It has also had implications for the spread of vulnerability among the population in Freetown, particularly those vulnerabilities attributed to socio-economic issues. The coincidence of this SAP implementation process with a period of war is indicative of the worsening experiences of the population and hence, of the extent of the prevailing vulnerability.

## **7.5 The Legislative and Institutional Framework<sup>9</sup> for Urban Planning**

This section examines the legislative and institutional frames that support the management of urban planning in Sierra Leone. It shows that planning in Sierra Leone is legislated and institutionalised at the central government level. It is also at this level that all planning policies and the regulatory guidelines for land use and physical development are designed and implemented. Yet despite being managed by the same Ministry, the policy and legislation on physical planning have been developed independently of the legislation on environmental management, which deals directly with climate change. It further shows that this apparent gap, which is the result of the separate histories in their evolution, is likely to make it difficult to integrate climate change into urban planning processes. This will be reinforced by the existing divide among the various institutions (local and national) responsible for the physical development of Freetown.

In what follows, this view will be further explored by analysing the current legislative framework that underlies the planning and development of Freetown before examining the

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<sup>9</sup> The sense in which 'Institutional framework' is used here is similar to that used by the OECD (2004), that is, all "formal provision(s) that assign primary responsibility [...] (and) authority to an agency". It determines who is responsible for what in the planning of urban areas.

institutional structure and the policy landscape that supports it. Having already examined the country's key planning legislation in Chapter Five, the focus here is on pointing out the difficulties which these frameworks pose to the integration process. The section will specifically highlight their implications in order to accentuate the need to go beyond the current rhetoric, that focuses on capacity in planning for integrating climate change issues.

### **7.5.1 The legislative framework**

*There shall be established a Board to be known as the Town and Country Planning Board... (Section 3:1). The Board shall be the authority for town and country planning in the colony (Freetown)... (Section 3:3). Every Planning Committee shall, at the request of the Board, submit to the Board within such time as may be prescribed...an outline planning scheme in respect of all lands within the Planning Area, with, the general object of securing proper conditions of health, sanitation and communication and amenity and convenience in connection with the laying out and use of the land. (Section 12:1) (Town and Country Planning Act of 1946)*

As has been pointed out earlier Sierra Leone has had a lengthy experience of planning legislation, starting with the introduction of the country's 1946 TCPA. This Act was introduced primarily to guide the orderly development of land and to ensure the existence of controls over the way the country's land was used. However, long before its enactment, the City Improvement Act (1900) was already in force (Doherty, 1985). This Act served as the principal legislation for controlling the way development was carried out in Freetown. The Act was, however, not directly planning-related since it applied to many other issues outside the remit of planning. Its enactment was specifically in response to the health and sanitation emergencies in Freetown following the massive urbanisation that occurred after a protectorate was proclaimed over the country's hinterland in 1896. However, because its main objective was to get rid of unhygienic conditions from Freetown, it did not focus specifically on physical planning and land-use control issues. Moreover, even though it authorised the enforcement of strong sanitary codes and planning standards in the development of houses (Doherty, 1985), it did not take adequate consideration of the negative impacts which housing and land use development actually presented to the city's environment. The result of its limited focus on housing demolition in the face of high housing scarcity and population pressures was the massive displacement that it caused throughout Freetown. This led to the worsening of the very problem of uncontrolled development that it sought to address (Doherty, 1985: 153). The shortcomings of this Act,

which were aggravated by the high standards that it prescribed for housing development, inspired the need for the enactment of the 1946 TCPA.

Like the City Improvement Act, one notable feature of this TCPA was the strong emphasis that it laid on land use and development control issues. As Breuer (1999) had earlier noted, planning practices generally tend to accentuate physical development issues, owing to the keen interest they place on managing the relationship between people and places (Birch and Silver, 2009). The effect of this emphasis was the attention that it drew from several of the environment-related problems that were to emerge from the city's growth process. As environmental issues, at the time of its framing, were constructed mainly in terms of forest management, such issues were hardly seen to have any physical planning role, since forest conservation was viewed differently from physical development issues. A key problem with this Act is that, even as environmental problems have continued to intensify as population pressures exacerbate the city's irregular growth, its core provisions have remained unchanged. Most of the amendments that have been applied to it were merely to accommodate (structural) change without making any major changes to its substance (FIAS, 2005: 74). The only Act that has witnessed a major review is the City Improvement Act which, in 1960, was transformed into the Freetown Improvement Act. This was in an attempt to redress the unrealistic standards set for housing development which led to the occurrence of unhygienic conditions in Freetown. What these two Acts (1946 TCPA and the Freetown Improvement Act) share is that, because neither has ever been subjected to any substantial review, most of the provisions they make are not only outdated and ineffectual but they are also overly restrictive. As these laws are still the dominant planning legislation for Freetown, these defects, in addition to the inappropriate ways in which they are enforced, arguably make them less supportive of any planned attempt to tackle and integrate climate change concerns.

### **7.5.2 Other relevant planning legislation**

As Sierra Leone does not have a unified law for planning and building regulation, a number of other bye-laws are also applied alongside these two Acts. Two of these (The Public Health Regulation of 1972 and the Public Health Ordinance of 1946) focus mainly on public health issues (housing layout, toilets), whilst one (the Rent Restriction Ordinance of 1953) guarantees security of tenure to land (Madanat *et al.*, 2006: 35). Several others,

including a range of statutes such as the ‘State Lands Act’ (Act No. 1960 as amended) and the ‘Survey Ordinance’ (Act No. 14 Of 1960) relate mainly to the management of land use. Because each of these laws was designed to deal with some specific issue about land (without necessarily focusing on the environment), their implementation has generally been chaotic and ad hoc (Government of Sierra Leone, 2005). As de Soto (2003) had noted, organisational actions can be complicated where the institutional environment requires compliance with too many rules and procedures. A major feature of this land-use management process, which causes much hindrance to the effective management of development processes in Freetown, is the importance with which it endows the court system, as arbitrator of land-related cases. The main reason for this is that land titles are not registered (Williams and Oredola-Davies, 2006: 1) in Sierra Leone and even though deeds are registered, they do not confer title to land. This situation is made worse by the unqualified hearing which the courts give to statutory declarations (Madanat *et al.*, 2006: 37).

Several environmental policies and laws do also apply to planning. But, as has already been emphasised, many of these laws, some of which date back to the pre-independence period, focus specifically on forest conservation issues. This makes it difficult for planning processes to take organised action about environmental issues in the development of Freetown. Moreover, because of the differences in their histories, even the post Brundtland laws on the environment are hardly considered in planning processes, since planning has traditionally focused primarily on land use controls. This has tended to privilege sectoral approaches in decisions regarding development (Biesbroek *et al.*, 2009: 234) in Freetown. This is, however, set to change with the recent introduction of the SLEPA Act (of 2008). One key feature of this Act is that, whereas before its enactment, it was the different ministries or departments that problematised and designed separate sectoral policies and strategies about the environment, it is now SLEPA that will now take the lead. This is in view of the powers it has to:

- *Act as the focal point on all issues concerning the environment; and to*
- *Coordinate and monitor the implementation of national environmental policies. (Environment Protection Act, Government of Sierra Leone, 2008).*

As climate change is now at the forefront of discourse about the environment in Sierra Leone, this reform process is likely to remove the disjointedness between planning and the

environment, in addition to reducing the bottlenecks in planning that are likely to inhibit the integration of climate change.

## **7.6 The Institutional Framework**

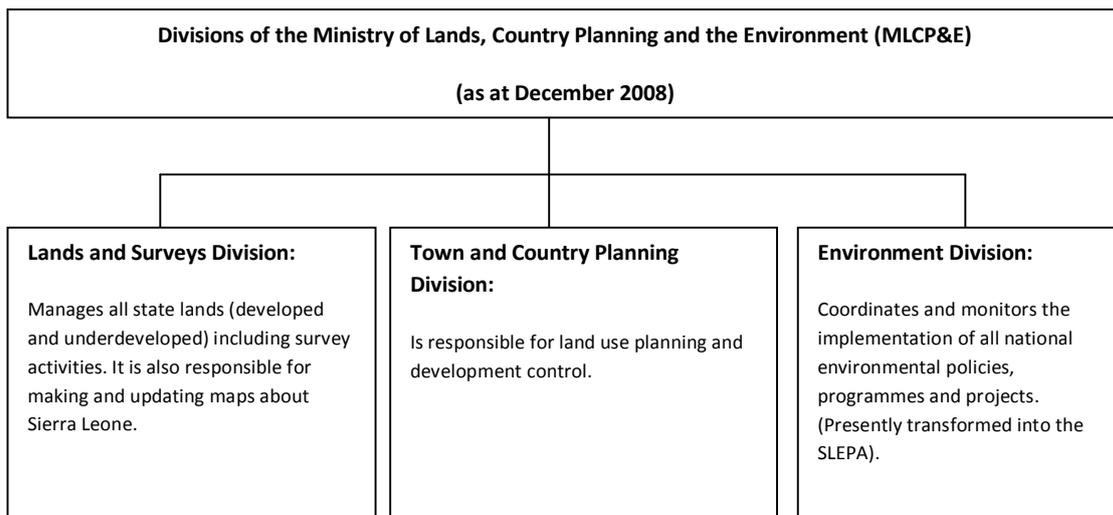
Urban planning in Sierra Leone is still highly centralised, despite the requirement of the Local Government Act (2004) for the transfer of certain planning functions to the local and municipal governments. The institutional framework that underpins this centralisation is very complex and blurred, and provides a difficult basis for the effective integration of climate change. To clearly understand the difficulties this imposes on the integration process, the next sub-section will start by examining the roles which the key planning institutions play in advancing the city's development process.

### **7.6.1 The role of the Ministry of Lands, Country Planning and the Environment (MLCP&E)**

In Sierra Leone, the MLCP&E is the main central government body with responsibility for urban planning and climate change management. The Ministry has evolved since 1961 from the Ministry of Housing and Country Planning (with no land and environment function), to the Ministry of Lands, Housing and Country Planning which was created in the 1970s. In mid-2000 however, its housing role was replaced with responsibilities for the environment which were hitherto performed independently by a variety of ministries and agencies. As the Ministry responsible for the implementation of all policies, programmes and plans related to land use controls and the environment, the MLCP&E operates through three main units (see Figure 17). It was designed in this way to ensure an integrated approach to planning and environmental interventions. This was to be done by making sure that environmental considerations were embedded in decisions about spatial and other forms of development. Nevertheless in Freetown, the Town and Country Planning division of the Ministry has always assumed leadership, since it is the main body that controls land use patterns through the enforcement of the relevant planning laws and regulations.

While the three divisions are assumed to work together in terms of making shared decisions about how the land space is to be organised, in addition to providing 'support' to enable one another's role, such a degree of collaboration does not exist. In particular, very

little information is shared between them concerning actions to promote development in Freetown. As a result, planning decisions are frequently made without much consideration of the implications for survey and land (about land cadastre, position etc.), nor the implications for the environment. Accordingly, sectoral approaches have taken pre-eminence in decisions about how Freetown should be developed. This is complicated by the fragmented planning functions performed by several other institutions that also have responsibility for the development of the city. The primacy of sectoral approaches to decision-making processes about Freetown supports Biesbroek *et al.*'s (2009:234) postulation that the foremost responsibility for addressing climate change in many cities is the very sector where such decisions are made. It is however questionable how planning can coordinate the varied response actions in Freetown when its relationship with the other two sectoral divisions is already fragile.



**Figure 17: The management structure of the MLCP&E**

### 7.6.2 The role of other stakeholder institutions at the national level

Various other institutions are entrusted with a range of responsibilities that are either directly or indirectly related to urban planning. Most of these institutions respond either to a specific or a partial aspect of the wider development problems of the city. The involvement of these many actors who are not necessarily required to collaborate with the MLCP&E results in the proliferation of parallel development interventions. Farvacque *et al.* (1992: 63-64) have referred to institutional fragmentation as one of the key problems

faced by planning in a developing country context. This is in view of the implications that isolated decision making processes may have for the role of other actors. At the central government level, these institutions include the Ministry of Works, Infrastructure, Housing and Technical Maintenance (MWIHTM); the Ministry of Finance and Economic Planning (MFEP); the Ministry of Energy and Water Resources (MEWR); the Ministry of Health and Sanitation (MHS); the Ministry of Transport and Aviation (MTA); and the Forestry Division (FD) of the Ministry of Agriculture, Forestry and Food Security (MAFFS).

The role of the MWIHTM is in particular very critical to climate change since it is the main body responsible for issuing building permits in the country. By setting standards for building design and construction along with the kinds of materials to be used, this Ministry significantly influences climate change mitigation and adaptation issues. Until mid 2009, this responsibility was one of the foremost roles of the MLCP&E and was, in fact, one of the key planning responsibilities that were identified for devolution to the local councils. Its transfer to the MWIHTM in spite of the many petitions by the FCC is reflective not only of the reluctance of the central government to decentralise planning, but also of its lack of confidence in the capacity of the FCC. It additionally questions the assumptions of 'governance' that actors (in this case, the central government) are willing to partner with and empower other actors especially at the local level. The decision not to transfer this function to the FCC is arguably a potential source of future conflict between the MWIHTM and the FCC, particularly when planning implementation roles are to be devolved to the local level. The implications of this conflict for Freetown are that it may exacerbate existing vulnerabilities, especially where decision-making processes by the two bodies are not based on collaboration. Vulnerability is bound to rise because several of the policy decisions made by the various stakeholder ministries are not based on any clear form of coordination. For example, whereas the MEWR has responsibility for the protection of water catchment areas in Freetown, forest depletion and reforestation matters are the direct responsibility of the Forestry Division. Clearly, to avoid unintended downstream consequences, policies in any one of these sectors should take cognisance of the policies of the other sectors (including land use planning), but such an approach has generally been lacking. Apart from causing the spread of vulnerability, the absence of collaboration among most of the allied ministries is likely to present difficulty for the planning process in effectively responding to climate change impacts in the city.

### 7.6.3 The role of other stakeholders at the sub-national level

At the sub-national level, these institutions exist mainly as line agencies, which implement policy on behalf of their parent ministries. Because many of these agencies are, in fact, the authorities responsible for infrastructural development as well as for the provision of urban services, it is important that their relationship with the MLCP&E is adequately established. Yet for many areas of Freetown, numerous physical developments by such line agencies as the Sierra Leone Roads Authority (SLRA), the Roads Transport Authority (RTA), the Guma Valley Water Company, the Sierra Leone Telecommunications Company (SLNTC) and the National Power Authority (NPA) have taken place without regard to any development plan. This is not a case of non-compliance with an existing development plan but that, to date, no such plan exists. This was confirmed in an interview with one of the planning officers at the MLCP&E:

*We still have no development plan for Freetown but there is currently an on-going process involving both the FCC and the EC (European Commission) to prepare a Freetown Development Plan. (EP-PMS2, 2009)*

Various scholars (Okpala, 2009; Van Den Broeck, 2008; Philips, 2007: 13-16) have emphasised the important role that plans and regulations play in promoting the physical development of cities. Farvacque *et al.* (1992) observe, however, that planning is complicated in most cities by the lack or inappropriateness of plans. Undoubtedly, the absence of a development plan for Freetown has over the years exacerbated the city's development problems, with each of the agencies intervening independently and on an *ad hoc* basis. This lack of control by the MLCP&E over such urban interventions is suggestive of the idea that the present institutional framework for urban planning is flawed (FIAS, 2005: 84). A major challenge which this presents to the MLCP&E is the steady demise of its power to coordinate the urban sector. As an example, while the road and traffic management roles of the SLRA and the RTA constitute a critical part of urban planning, in part, because of the way they manage road traffic problems and, also, because of the guidance they provide to urban spatial development, there is hardly any coordination between the two bodies and the MLCP&E. In the same way, the Guma Valley Water Company and the National Power Authority hardly inform the MLCP&E when expanding their infrastructure networks in the city. From an institutional perspective, collaboration is problematic because each of these bodies has continued to follow the taken-for-granted rules of their respective organisations. The effect of this for climate change is the likelihood of spreading maladaptation, especially when the service providers do not

themselves collaborate. It seems reasonable to argue, therefore, that unless these sectoral and institutional gaps are sorted out in ways that will allow the MLCP&E to regain full control over the city's physical planning process, it may prove difficult for planning to effectively address climate change concerns.

#### **7.6.4 The role of other stakeholders at the local level**

Because planning decisions in Sierra Leone have always taken place at the central government level, there is no functional institutional framework for urban planning at the local level. However, as observed by Khanna and Palepu (1997), this institutional vacuum has been filled in by informal connections and relational governance structures. The FCC and a couple of NGO's and CBO's are the most active institutions at this level. The role of the FCC is particularly critical at this level because of the mandate that it has to provide for the delivery of essential services within the Freetown municipality. However, in spite of the provisions of the current Local Government Act (2004) for the transfer of some vital planning functions<sup>10</sup> to local governments, nearly all such functions are still being carried out by central government (Minervini *et al.*, 2008). This implies that the local level where development actually takes place and the local communities and groups that are affected by such planning decisions are largely excluded from the planning process. It therefore becomes particularly difficult to mobilise planned actions for climate change at this level. This is primarily in view of the low capacity that exists at this level as well as the severe constraints on resources to drive the process. The absence of a role for planning at this level raises important questions about some of the fundamental assumptions about the collaborative planning process. These relate to such issues as: a) how can local communities influence decision-making processes under a centralised system of planning; and, b) how can local community actors be empowered both to express their views and to also challenge proposed interventions arising from the centralised planning system regarding their communities?

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<sup>10</sup> The Second Schedule of the Local Government Act (2004) outlines a number of important planning functions to be transferred to local councils. Two of these are the preparation of a land use plan as well as a strategic local plan.

As a result of the immense capacity gap at this level, the European Commission (EC) in 2008 initiated a diagnostic study with the objective of building up the FCC's capacity to effectively manage and plan of Freetown. As a prelude to this, a Development Planning Unit was set up within the FCC. The creation of a Freetown Development Plan is already envisaged as part of the process. Nevertheless, while the EC has begun some quick-win infrastructural development activities in Freetown, to minimise the incidence of hazard and disaster events, most of its activities do not make any specific reference to climate change. This is in spite of the extensive project support that it has already provided to protect and manage Sierra Leone's forest reserves.

### **7.6.5 Summary**

This section has highlighted that even though the MLCP&E is the central body responsible for all urban planning-related tasks in Sierra Leone, planning functions are performed by many other institutions which are not required to collaborate with the MLCP&E. The isolated intervention of all these varied institutions to address partial aspects of the city's wider development problems is at the heart of the growing vulnerability in Freetown which climate change will reinforce. The absence of an organised institutional framework for planning at the local level and the reluctance of the MLCP&E to transfer planning functions to this level has the potential to aggravate this condition. Central to all this discussion is the suggestion that the institutional environment for planning, as reflected by the legislative and institutional frameworks, is not adequate to support the integration of climate change. This will be made especially difficult by the lack of capacity for planning at both (central and local) levels of government, including the absence of a functioning governance process.

## **7.7 Managing the Physical Landscape: The Challenge for Urban Planning**

This section reviews some of the relevant policies that apply to the urban sector. It specifically investigates how these policies and regulations, as well as the isolated decision-making processes of the various government ministries and agencies, have worked to shape the way the spatial structure of the city has been produced. The section

additionally examines the key processes involved in controlling the development of Freetown and points out some of the critical challenges which these are likely to present to the integration of climate change. It is emphasised here that whilst it is possible to associate several urban processes with the urban sector, many are however not directly related to planning. This analysis is therefore, only limited to urban planning issues since the thrust of this discussion is to unravel the key weaknesses in the Sierra Leone planning system that are likely to hinder the integration of climate change issues into policy making and planning.

### **7.7.1 National urban policy/strategy**

Sierra Leone has no specific national urban policy or strategy and, urban development has rarely been considered as a priority issue in any of the country's national legislation and plans. Nevertheless, it was possible to infer policy frames from a number of the leading national laws including the legislation of certain sectors. One such law, which represents the government's first ever attempt at dealing with the urban sector, is the City Improvement Act (1900). This legislation is a landmark document because it was the first conscious approach to eradicating unplanned development in Freetown. This was an attempt to address many of the drawbacks that were associated with the rapid rate of population growth in the Freetown colony (Doherty, 1985). However, because its focus was more on the growing sanitation problems of Freetown, it did not pay attention to environmental degradation issues. Its unrealistic standards and the strong emphasis it placed on the enforcement of sanitary and building codes in the inner city, led to the rapid growth of peripheral settlements (due to the large-scale displacement) with severe implications for the environment. Although this Act was later reviewed in the Freetown Improvement Act in 1960, several of its rigid standards were never relaxed. One such standard relates to the type of materials that were allowed for use in housing development:

No wall of any building shall be constructed of any material other than masonry, cement blocks, cement concrete [...] reinforced concrete, or other approved materials. (Code 23:1, Freetown Improvement Act, 1960).

In line with Philips (2007: 13-16), while this Act sought to enforce control over the city's development process with a view to improving the living conditions of people, it did not ensure that the standards met the capacity of the low and middle-income groups. Arimah and Adeagbo (2000: 281) have emphasised that, if planning regulations are to be

considered relevant, they must be tailored to meet the socio-economic conditions of those required to comply with them. The absence of such considerations has led to the irregular expansion of Freetown into many places hitherto considered as non-development areas. Surprisingly, this Act still continues to be used as a leading planning tool in spite of these drawbacks.

Sierra Leone's first NDP (1974-1979) is another valuable document that has had implications for the urban sector. Like the first two Acts, this plan also had urbanisation issues as one of its key concerns. In particular, the plan had a whole chapter devoted to housing and national planning issues and was in fact, the first serious attempt by government to call for an organised approach to the development of cities (Government of Sierra Leone, 1974). The plan also recognised the importance of protecting the environment:

A sound economic development strategy requires the national management of natural resources as opposed to their wasteful utilisation. Ecological principles should be applied to the exploitation of these resources. (First National Plan 1974-1979, Republic of Sierra Leone).

Yet, apart from its failure to establish targets for the delivery of new housing units, few of the Plan's implementation strategies focused on environmental protection issues, since much of the emphasis was placed on the promotion of economic growth. The TCPA which was to provide the legislative basis for this plan and which was in fact the key policy framework for all physical and spatial development issues, did not specifically have environmental degradation issues as its main concern. However, unlike the first plan, the second NDP (1979-1984) had little reference to urban development, including the housing sector. As this lack of attention to evolving an organised strategy for urban settlements has continued to date, it has led to the deterioration of many areas of Freetown which climate change will exacerbate. This will be reinforced by the outmoded state and general lack of fit of nearly all current policy laws applied, in spite of the call by the Habitat Agenda for countries to make periodic reviews to their planning laws and regulation to make them more practicable.

Other policy regulations relating to the urban sector are the sector-specific laws of some government ministries and agencies involved in urban development. Most of these regulations, which apply predominantly to infrastructure and service delivery, are scattered across many different sectoral laws which isolate them from 'mainstream' planning rules.

The key problem with this arrangement is that, rather than working to facilitate coordination in the development of Freetown, they have instead resulted in the duplication of roles, with many parallel interventions taking place (Minervini *et al.*, 2008). Van Den Broeck (2008: 265) had noted that planning regulations are generally embedded in an institutional context and that, once created, they always evolve new power relationships. Coordination has thus been difficult because organisations prefer consolidating their powers by means of following the rules. As most of these laws were designed without appropriate considerations of the roles of other institutions, including their existing legislation, a complex policy environment has thus developed which has proved to be particularly difficult for achieving the aims of urban development. To understand the complexity which this poses to the development of Freetown in the face of climate change, it is critical to investigate the way urban planning is carried out in Sierra Leone.

## **7.8 Urban Planning at the National Level**

As was pointed out earlier, the 1946 TCPA which provides the legislative framework for physical planning in Sierra Leone does not require any consideration of climate change in planning processes. However, because the Act requires all towns and cities to prepare urban development plans to guide their growth processes (see Section 7.5.1), it is arguably well placed to reduce the spate of GHG emissions (especially from deforestation) in Sierra Leone in addition to the disasters that occur in Freetown. The requirement by several of the other Planning ordinances and ancillary legislation of the Act that cities should institute ‘robust’ mechanisms for development controls further supports this role. In Freetown, while this function has been carried out over past decades by Central government, the pervasiveness of unplanned growth and the widespread unacceptable living conditions in the city are evidence of the government’s inadequacy to deal with this challenge

With only a few (five) trained and qualified town planners in the MLCP&E, along with few and inadequate planning facilities and resources, planning in Sierra Leone is generally very rudimentary. In Freetown, most of the development activities that have taken place have been carried out outside planning control and in very *ad hoc* ways (Harridge, n.d. post 2007). This lack of capacity at both the national and local levels has, in many areas, resulted in inappropriate land uses, with entirely dissimilar activities taking place within

the same neighbourhood. In expressing his resentment of this state of affairs in Freetown, one interviewee from the civil service for instance, stated:

*“People just build when, how and where they like without regard to law and order. There is a template that existed in the 1950s or even earlier on how Freetown should develop but it has totally been ignored over the years. I think the problem has been one of complete lack of understanding of planning issues – how they relate to the built environment, how they relate to even the building industry.”* (CG-DPC2, 2009)

This problem is exacerbated by decades of non-preparation of urban development Plans due to the Act being largely obsolete, in addition to the MLCP&E’s lack of capacity to effectively enforce the relevant planning rules. This, together with the lack of cooperation among the various divisions of the MLCP&E and the poor coordination that exists between the different institutions involved in urban development, has made it easier for land developers and the public to ignore planning control rules. The difficulty which this presents is the constraint that it will pose to any future efforts at integrating climate change, since the MLCP&E, which is responsible for the planning of Freetown, has already proved to be practically unable to enforce the rules. Other constraints will result from planners’ limited understanding of the impacts which climate change will present.

In order to provide a better understanding of these challenges, the next subsection will explore the key processes that underlie urban planning as it relates to Freetown. It will specifically examine the various standards required by the TCPA, in addition to the key shortcomings associated with the current planning practices. The section will end with a review of the powers that the Minister (MLCP&E) has to declare any area of Sierra Leone as a planning area, since it is this declaration that now forms the basis for the preparation of any Planning Scheme in the country.

### **7.8.1 Control of settlement development**

*“The first thing we always want to know from our clients is whether or not the land is unencumbered. The minute you start asking them questions about title deeds including other relevant documents relating to the land, some will never come again. Others do not even come to us because they do not want us to ask them such questions.”* (EP-PBE2, 2009)

The above view from one of the professionals involved in the building industry reflects the level of uncontrolled development that is still on-going in Freetown. In the city, the

development control process involves the obligatory observance by (land) developers of various planning regulations and procedures. However, because this process is not informed by any defined Master Plan<sup>11</sup> or Urban Development Plan, it provides a difficult climate for urban planners to regulate land uses in the city. For example, while the 1946 TCPA Act clearly requires site developers to ensure that they first secure planning approval prior to developing any land in urban areas, numerous houses in Freetown have been built outside of this law. Although the weak enforcement systems and the unrealistic building standards may have largely accounted for such practices, the lack of a Master Plan to guide the city's development process has been equally critical. Since most low income groups have usually developed their houses outside of planning rules, it has not been possible to limit the expansion of Freetown in unsafe areas. In this regard, it can be questioned whether the principal-subject relationship between the Planning Ministry and those affected by its rules (the public including land developers), as defined by Mabogunji *et al.*(1978) still holds. In particular, the lack of capacity within the MLCP&E to control this growth has led to the creation of vulnerability in many areas of the city. This is aggravated by the *ad hoc* addition of houses and the development of new settlements in at-risk areas. In view of the present situation, it can be argued that there is a clear need for institutional and capacity development of urban planning processes if they should effectively integrate and address climate change considerations.

### **7.8.2 Planning application**

One important aspect of the development control process which offers immense opportunities for planners to curtail the spread of vulnerability in Freetown is the body of information that is required from developers at the time of making planning applications. Developers are especially required, amongst other things, to clearly state the purpose for which the land is needed and the percentage coverage of the plot area or setback. The 1946 Act makes the submission of this information, along with the relevant title deeds,

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<sup>11</sup> At the time of the field research, the MLCP&E communicated the fact that no Master Plan or Urban Development Plan exists for Freetown. It was reported however that both plans used to exist for the city at the time of the country's independence in 1961. No reason was given for the present lack of a comprehensive plan.

mandatory for all developments in towns and cities and any developer who fails to make such an application is either liable to a fine or may risk losing the development to demolition. However, the absence of a clear Master Plan to guide the process of urban development and ensure more integrated planning in Freetown has made it difficult to enforce this law. This is reinforced by the opacity of the planning process itself, owing to the unavailability of planning regulations and standards to the wider public. Thus, whilst developers are required to strictly adhere to building and land use plans, as well as the existing bye-laws and standards of the MLCP&E, many are, in reality, unaware of these laws. Consequently, compliance has been extremely low, particularly for developments on private lands, which usually require long and costly processes in order to gain approval.

Another difficulty that prevents private developers from adhering to this rule is the slow and unwieldy process that is often associated with it. In general, even after the survey plan has been approved by the MLCP&E, it has to undergo various other (non-planning) bureaucratic processes before it is finally endorsed. This unwieldiness is similar to the case for planning applications for state lands. Although applications here are initially for leaseholds, once 'substantial' development has been made on the land, an application can be made for a freehold. Because the processes are usually very cumbersome, it may take up to four years to even acquire the initial leasehold (Madanat *et al.*, 2006: 35-37). Obduho (1998) has emphasised the level of corrupt practices associated with land allocation processes in the cities of the developing world. This is exactly the case with Freetown, where planners, working together with the elites, tailor planning practices to suit their own interests.

Another major weakness with this application process is that because the planners' role officially ends with the approval of the plan, it is usual for developers to diverge from what has been originally approved with regard to the plan. This is in spite of the requirement for a new application to be made when a different development is proposed or, when an amendment is needed to the plan. The prevalence of this practice of diverging from what has already been approved on plans is also contributing to intensify vulnerability, especially in settlements where developers tend either to encroach on vacant lands or to subdivide their land. In the settlements of Regent and Hill Station, where housing development is more focused along the hill slopes, the severe runoffs after heavy rains impinges on the new housing that has not been built to plan.

### **7.8.3 Application for building permit**

Even though the Act provides for developers to make applications for building permits in order to determine the ownership of the land for which the application is made, there is hardly any adherence to this directive. Even where permit applications are made, they are frequently not accompanied with the complete documentation that is needed which includes such information as the site plan or the design of the building that is to be put up. Moreover, whilst the Freetown Improvement Act provides for Building inspectors to visit the site in order to verify ownership and the manner in which the construction work is taking place, such visits are rarely conducted, due mainly to lack of staff and resources to work with. It was therefore common for building permits to be issued for sites, even though the land is not owned by the applicant. One major weakness of the building permit process which has worked to intensify vulnerability in Freetown is the lack of consideration given to utility drawings (water mains, telephone lines) in building designs. This primarily reflects the continuing disconnection between the city's land use planning processes and its infrastructural development processes, in which utility companies are not seen as an integral part of the city's planning process. This finding has similarly been observed in an earlier study by Madanat *et al.* (2006). Farvacque *et al.* (1992: 62-64) have also identified this to be among the major challenges faced by planning in the cities of developing countries. The implication of this fragmentation is that buildings have been developed, even within planned or formal settlements, without having any connections to utilities. Over past decades, this absence of 'proper' planning practice has reinforced the vulnerability of several neighbourhoods which climate change will reinforce. As shown in Section 6.4, vulnerability is high because many households do not have access to some of the necessary infrastructure (water and electricity supply systems, sanitation systems) for improving their livelihoods as well as their living conditions. In view of the foregoing, it can be argued that, while urban planning has the potential to reduce emissions and, also, adapt cities to climate change, it is unlikely to do so in Freetown since the planning process is, itself, both undeveloped and ineffective.

### **7.8.4 The enforcement of planning rules**

Although, given the rising trends of abuse, the MLCP&E is expected to enforce the relevant planning rules, such enforcement procedures are rarely put into effect. Even where implemented, the process is often very slow, with hardly any consideration given to

penalties. Enforcement is poor because of the severe constraints faced by the MLCP&E. These relate to lack of capacity specifically in terms of the number and quality of staff, poor wages and a lack of adequate working materials. Van Den Broeck (2008) has shown that as institutions, planning regulations are context-embedded and the extent to which they address issues depends not so much on their robustness but on how supportive the context is. Enforcement is poor in Freetown because of the inadequate support that is provided to the planning process. With this enforcement failure has emerged a culture of near-total disregard for planning laws, especially because some of the standards prescribed are way above the reach of the low-income groups. Thus, in spite of the prohibition which these laws place on the use of locally-sourced housing materials in Freetown, most of the poor and low-income groups have always relied on them to meet their housing needs.

Because such developments have usually taken place outside formal planning control areas, they have tended to concentrate mostly on marginal lands. It seems reasonable to argue therefore, that the poor capacity which the MLCP&E has to effectively enforce the country's planning legislation is one of the main causes of the uncontrolled and irregular development in Freetown. One NGO worker I interviewed for instance observed that:

*“In the last two decades, we have had too many illegal settlements emerging here. You find them all over, right across Freetown, and these settlements continue to grow day after day. It is like every other day you move out, you see a new illegal settlement emerging.” (SL-NGO4, 2009)*

This trend is exacerbated by a lack of transparency in the planning system, with most of the development processes taking place through patronage and corruption. As most of the unplanned development is carried out by poor and middle income groups, who are mainly priced out of the land market, such uncontrolled developments have tended to concentrate in unstable areas of the city. Because these neighbourhoods generally lack essential services and infrastructure (poor and inadequate roads, drainages and sanitation), vulnerability is often very high. This is reinforced by the place of location of settlement (flood plain, hill slope), the concentration of urban poverty and the kinds of shelter that predominate. Given their peculiarity, it can be conjectured from the various IPCC conclusions about poorly-developed coastal cities, that the impact which climate change will bear on such settlements will be overwhelming.

### **7.8.5 Preparation of development plans**

The requirement of the 1946 TCPA for land developers to develop and use land only in accordance with the relevant development plan approved for the city is another noteworthy provision that could have helped to reduce the unplanned growth and vulnerability of Freetown. The rationale for this authorisation at the time of its framing was mainly to prevent any further uncontrolled development of the city, as had been happening in the early part of the 20<sup>th</sup> century. Cap 81 of the Act specifically required that in addition to the preparation of the (periodic) development plans, cities should also prepare and submit to the planning ministry the systems of control for such developments. These systems of control were particularly needed to ensure that the government had effective control over land use as well as the overall development process. Given the importance that was entrusted to them, these two requirements could arguably have worked to reduce climate change vulnerability in Freetown. This is because of the guidance that they were intended to provide to the development process by ensuring that the urban and natural environments are well protected.

At the time this Act was ratified, the power to enforce these requirements was vested specifically in the Town and Country Planning Board. This Board exercised overriding powers including the power to refuse permission for any development that did not conform to the plan. In the case of Freetown, the Board also had powers to acquire land compulsorily for the purpose of development and to recommend compensation packages to property owners whose rights to such properties were forfeited in the cause of development. However, within just under a decade of gaining independence, the Town and Country Planning Board was abolished in a 1969 amendment of the Act. Since 1969, when its powers were transferred to the MLCP&E with the concurrent extension of the Act to other newly developed towns, (Joko Smart, 1973: 58), compliance with this rule has been largely problematic.

### **7.8.6 Declaration of a planning area**

Another milestone document that had the potential to reduce the spread of unplanned development and the intensification of vulnerability in Freetown is the 2001 amendment to the TCPA. This Act empowers the responsible Minister for the MLCP&E to declare any

area of Sierra Leone as a planning area, provided the declaration is made in consultation with the authorities and the people affected by the decision.

“...the Minister may by order declare that the whole of Sierra Leone or the area, so specified by a survey plan, as case may be, shall be a planning area (Town and Country Planning (Amendment) Act, Government of Sierra Leone, 2001)

The amendment provides that anyone affected by such a declaration can make representation to the Minister for possible modifications of the plan or may be due for compensation. Even before this amendment, there was also the Compulsory Acquisition Act (Cap. 118 of 1960 as amended in 1961), which allowed the state to acquire any area of land in the country for development purposes. However, because these two powers have been sparingly used, owing to the protracted delays involved in making betterment or compensation payments, they have not worked to reduce the irregular growth of the city including the development of settlements in unstable areas.

## **7.9 Urban Planning at the Municipal Level**

As highlighted in Section 1.7, one of the major limitations to the role of municipal authorities in carrying out urban planning functions at the local level was the abolition of local governments in 1972. Although this decision did not lead directly to the closure of the FCC, owing partly to its unique history, as well as its presence in the country's capital city, its role and significance in the planning process were nevertheless not adequately recognized. As the only body in Freetown that has always had the statutory mandate for providing and maintaining the basic urban infrastructure and services of the city, the FCC is better positioned to actively engage with local communities in improving the living conditions of Freetown. Yet the lack of recognition of this role, especially in planning processes, has led to the spread of vulnerability in the city, with several of the deprived and unstable settlements being the most affected. The over-centralisation of planning responsibilities at the central government level and the narrow political space allowed for alternative actions by the FCC is suggestive that, contrary to popular assumptions about cities (Tasan-Kok, 2008: 191; Harvey, 2005; Stiglitz and Green, 2002), Freetown has been largely unaffected by the flexible forms of planning systems that accompanied the neoliberal approach.

With the enactment of the Local Government Act (2004), however, several central government functions are now being authorised for devolution to the local government level. The Act specifies in particular that local councils should be allowed greater autonomy in the exercise of these new roles. With this authorisation, the FCC is expected to be well-positioned to identify its own priorities and needs and, hence, undertake activities that reflect the realities at the local level. The main planning activities to be devolved include the survey of land, the preparation of land use plans, the issuance of building permits, the registration of land and the control of the illegal sale of land. The key limitation, however is that, while various other ministries have already devolved certain functions to the FCC, no urban planning function has so far been devolved. In addition, although responsibility for the issuance of building permits was due to be transferred to the FCC, an order from the President's office overruled this decision, mandating the relocation of this particular role to the Ministry of Works, Housing and Infrastructure (MWHI). This action has not only engendered doubts about the capacity of the FCC, but is likely to validate justifications for the slow pace of the transfer of the various responsibilities that should be entrusted to it.

### **7.10 Summary**

This section has shown that, although Sierra Leone does not have a specific policy concerning the urban sector, there are a number of laws which, either directly or indirectly, influence the growth of urban settlements. Yet, while some of these policies have focused on reducing the unplanned growth of Freetown through urbanisation controls and the enforcement of stringent planning controls, they have rarely focused on the consequences which these actions might have on the environment. Consequently, their continued application has tended to undermine the very objectives that they seek to promote. It is shown further that because some legislation has been designed without adequate consideration of other laws in the existing body of legislation, it has created a complex environment for the various institutions to collaborate on issues about urban development.

The section has also pointed out that, although many of the provisions of the 1946 TCPA could have worked to minimise the current vulnerability of Freetown, these have not been effectively implemented. In Freetown, most of the developments that have taken place have been created in very disjointed ways, with no specific guidance from development

plans. Other causes for this unplanned development relate mainly to the poor enforcement of rules, the cumbersome processes of planning application, the poor enforcement of the planning permit system and the prescription of inappropriate standards for housing development. The enforcement of development control is, in particular, problematic because the Act does not provide any penal measure for cases of non-compliance. This, together with the other causes along with the inadequate capacity of the planning ministry has, over the decades, led to the proliferation of squatters and illegal developments. The consequence of this in relation to climate change is the intensification of vulnerability in many areas of Freetown. This is aggravated by the increase in housing demand and the consequent rise in the incidence of land grabbing. This has led to the proliferation of sub-standard housing conditions and the rise in the occupancy of unsafe settlements. It is also argued that the lack of recognition of the FCC's role in planning at the city level may have serious implications for vulnerability in Freetown, considering the scope of responsibilities it is required to perform. Whilst the Local Government Act (2004) requires the transfer of some planning roles to the FCC, the MLCP&E is yet to conform. This has tended to create difficulty to local level participation (community groups and organisations) and in the embedding of local climate knowledge and experiences in planning decisions.

### **7.11 The Key Climate Change Challenges for Planning in Freetown**

The previous sections have so far analysed two important aspects of the planning process. The first examined some of the key features of the legislative and institutional framework for urban planning while the second focused on a discussion of the important processes that have led to the current spatial patterns of land development in Freetown. This section builds on these issues to identify and discuss a number of critical challenges for Freetown of integrating climate change considerations into the planning policy framework. Central to this discussion is the way the unplanned growth of Freetown and the lack of appropriate infrastructure and services in many places have combined to increase the city's vulnerability. This is intensified by the lack of adequate capacity in both the MLCP&E and the FCC to effectively plan for the city's development, in addition to integrating climate change. The section also briefly outlines the on-going efforts of the European Commission (EC) to build capacity for the planning and development of Freetown.

### 7.11.1 The proliferation of informal settlements in Freetown

As population growth has increased over the decades, the rise in informal developments and the proliferation of slums has become a dominant feature of Freetown. In his work on ‘Housing and development in Freetown’, Doherty (1985: 151) has, for instance, shown that this incidence of unplanned development had a long history, particularly along “the foreshore areas of Susan’s Bay and Kroo Bay”. This same occurrence was also mentioned in the Interim Town Planning Committee Report of 1948, which described such settlements as ‘shanties’. The growth of informal settlements is arguably one of the foremost challenges of planning for climate change. While Cohen (2006: 63-64) attributes much of this unregulated growth in cities to the dramatic changes in the world’s economic, political and technological systems, in Freetown, it is possibly the poor planning systems, the centralised political system, the urban-biased government policies and the immense displacement caused by the war that may have accounted for this. For example, between the periods 1991 to 2001, much of the population growth that occurred in Freetown was attributed to the civil war. This was due to the city’s relative stability and security compared to the provincial areas at the time. Many respondents consider this increase to have caused a lot of damage to Freetown:

*“During the war, we had too many people from the provinces coming to live in Freetown. This influx has had too many impacts on all the natural resources around us – the water, the land, the vegetation, I mean just everything. You find people building houses almost everywhere – in areas that we once thought were forbidden; in areas that we thought were disaster prone.” (EP-PMS1, 2009)*

Even after the war, Freetown has continued to attract massive in-migrations, owing to people’s unquenchable hopes of finding better opportunities in the city context.

Although informal development is now widespread in Freetown, it is possible to make a crude distinction between the more affluent settlements and the blighted areas of the city, based on the different housing and environmental conditions. Doherty (1985: 152) highlights this dichotomy in his work by noting that while housing quality can be determined by the type of housing (concrete, mud, zinc), it is the density and location of the housing structure (including the adequacy of water supply and sanitation) that determines the quality of the housing environment. He argues, based on this position, that, unlike the well-planned areas at Hill Station and Wilberforce, it is such settlements such as Kroo Bay and Susan’s Bay that are the areas of Freetown most to be deplored. This

viewpoint was found to have retained its validity, especially for the slum settlements, where such conditions were found to be far worse off than the affluent areas. This view is supported by UN-Habitat (2009) which reports that already, 82% of all slum settlements in Sierra Leone lack any improved form of sanitation, with several being either overcrowded or lacking in basic urban services. In its state of the World's Cities report for 2004/2005, UN-Habitat classified Sierra Leone as having the worst slum scenario in Sub-Saharan Africa. Another of its reports in 2008 also identified Sierra Leone as one of the countries with the highest slum concentrations in the world, that are also "associated with multiple shelter deprivations" (UN-Habitat, 2009). As population growth and irregular development proliferate in the wake of climate change threats, the challenge which these pose to the planning of Freetown is undoubtedly far-reaching. This is in view of the frequency and intensity of hazards (floods, landslides, extreme rains) that are now experienced. Although concerns are now expressed at the central government level about slum upgrading, not much has been done in terms of putting in place appropriate policy frameworks and technical resources that will prevent any further spread of informal development. The current pace of this spread underlies the extent to which the different parts of Freetown are now made vulnerable to climate change.

### **7.11.2 Socio-economic and ecological processes affecting urban planning**

As has been variously highlighted, vulnerability in Freetown is on the increase because the city's rising population levels have generally not been accompanied by a corresponding rise in people's living conditions. Since the 1980s, when population growth became more apparent and, especially, during the rebel war period when it intensified, the uncontrolled development that it caused led to the pervasive degeneration of whole localities. This trend, which is now broadly visible wherever this population had tended to concentrate, reflects the high shortage of housing provision in the city. The decades of neglect and underinvestment by the central government in this sector, as well as the immense damage that was caused by the war to the existing housing stock and infrastructure have together coalesced to create this state of housing insufficiency in the city. In eastern and central Freetown, where this situation is more obvious, most of the uncontrolled development that has occurred has taken place on marginal lands with rarely any consideration for planning regulations and exposure to risk. In an interview with one of the planners at the MLCP&E, it was found that:

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*“Because the Ministry was aware of the risks associated with most of such places, no land allocation was made for the entire area. Nevertheless, people invaded such places, ignoring all the risks posed to their lives.” (EP-PMS2, 2009)*

This problem continues to be exacerbated by the neglect of such areas in the provision of urban services and in the improvement of living conditions. This is in part because of the settlers’ lack of rights of tenure to the lands that they squat on, in addition to the precarious nature of the houses that are built. Cohen has observed that rapid population increases can sometimes overwhelm the capacity of city authorities to provide the required services to support urban livelihoods. This seems to be one of the greatest challenges currently faced in Freetown. As these settlements concentrate a significant proportion of the urban poor, the lack of provision of good drainage, sanitation and water supply systems is likely to intensify their vulnerability to climate change impacts. Already, many of these places (Susans’ Bay, Mabayla, Moyiba, Dwarzark, Banana Water) are renowned among the most at-risk areas of Freetown, owing to the level of damage that result from hazards.

The observed pace of environmental degradation in Freetown and the ensuing urban disasters that are associated with it, have been variously attributed to the range of human activities that are taking place. Prominent among these activities is the widespread housing development along the foothills of the Peninsular Mountain and in the low-lying areas of the coast. Because most of these activities seem to have occurred outside the formal planning system, they have exerted immense pressure on the city’s natural and ecological systems. One major area of concern has been the widespread practice of deforestation in many of the reserves of the Peninsula forest. As was observed in many places, this spate of forest clearance for settlement development has increasingly altered much of the urban habitat, leading to the leaching of soils. As was observed by one of the respondents:

*“The challenge posed by deforestation is huge and it will continue to be like that until planning is taken very seriously in this country. Issues pertaining to the environment are never taken seriously in this country until disaster is imminent.”(CA-ACA2 2009)*

Other widely-practiced activities, such as stone mining and sand mining, may also have led to the destruction of local species. It is argued that the persistence of these activities, if left uncontrolled, will be likely to erode the city’s capacity to provide a buffer against any unforeseeable rise in sea levels, particularly from sea surges, tides and rise. The fact that these activities are still on-going clearly presents urgent and far-reaching challenges to the

current and future development of Freetown. It also raises questions about the most acceptable planning policies that can not only accommodate this uncontrolled growth process, but can also address the current and future vulnerabilities of the city which climate change will potentially intensify. Satterthwaite *et al.* (2007) have emphasised that urgent solutions are required in order to redress vulnerabilities of cities in low-income countries, such as Freetown, where population growth is expected to further step up in the next few decades. This view was in fact one of the issues emphasised by one professional from the construction industry:

*“We cannot continue building in this way, we are destroying the environment, destroying the beauty of Sierra Leone. There are certain norms, certain guidelines even in the old Freetown Improvement Act which we should have been abiding by, which we should have been looking at, and which we haven’t been. It has been disregarded by all the stakeholders so we are practicing in a very unplanned environment – that’s what is happening.” (EP-PBE1, 2009)*

Yet how far such redress is likely to be inspired through planning responses will be determined by the current capacity that exists at both the national and local levels.

### **7.11.3 Institutional capacity**

The study reveals that very limited capacity exists for urban planning within both the MLCP&E and the FCC. It additionally reveals that very little knowledge exists about climate change in either institution, with each having inadequate capacity to integrate climate change concerns into their respective planning processes. This lack of knowledge and skills is due partly to the fact that, to date, no curricula exist in any of the universities in Sierra Leone for urban planning-related studies and climate change. Although a curriculum was proposed for Architecture, Surveying and Meteorology in 2006, it is only for the discipline of Surveying that training has recently commenced.

At the level of the MLCP&E where planning processes have always concentrated, the lack of capacity to integrate climate change is exacerbated by the non-existence of a clear Master Plan to guide the city’s development process. As has been pointed out earlier, the only plan that ever existed to guide Freetown’s development was the Freetown Improvement Plan, which was first introduced in 1900 but was later revised in 1960. This lack of an up-to-date Master Plan, along with the low capacity of most of the planning officials, is reflected in the poor decision-making processes relating to land use planning

and the overall development of the city. Planning decisions have usually taken place within narrowly-confined units consisting only of the designated departments of the MLCP&E, which operate outside participative processes. As the FCC and NGOs are normally not part of the decision-making processes for urban planning and climate change, they do not have the capacity to support communities in enhancing their coping and adaptation responses. This inadequacy of the governance process bears evidence of the inadequacy of the planning process. It also raises questions about the potential for evolving a clear strategy, both for integrating and tackling climate change in ways that draw support and commitment from the local level. Nevertheless, with the support of the European Commission (EC), there are now efforts to develop the planning capacity of both the MLCP&E and the FCC. The eventual outcome of this support will be the development of a Freetown Development Plan to steer the city's development process. Already, a land registration system has commenced with Geographic Information System (GIS) training skills being delivered to enable planning decisions in Freetown to be adequately informed about land availability and entitlement.

The key challenge that this process faces, however, is the absence of the appropriate planning structures required at the local level, where the integration process will have to be practically carried out. For example, in 2009 when the European Commission (EC) commenced its diagnostic study of the capacity of the FCC, no specific unit was found that had full responsibility for urban planning issues. All the development activities that had been carried out by the FCC were undertaken mainly by its Engineering unit, with hardly any such activities being subjected to professional planning advice. An EC-funded study in 2008 in particular, drew attention to the human capacity constraints of the FCC. The report shows that, of the 120 staff that worked within this body, only 7% were either trained or qualified in the various capacities<sup>12</sup> that they served. Given the high (93%) proportion of its staff that are unskilled and unqualified, it is inconceivable that the FCC will be able to adequately undertake any meaningful integration process without first having its capacity developed. These two bodies would moreover require some major reforms in the attitudes and beliefs of their political and professional personnel in addition to the provision of funds. Some specific capacity building areas may include the provision of skills in plan-

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<sup>12</sup> This consisted of two trained and qualified civil engineers, three foremen and three administrators.

making, developing up-to-date Master Plans (for Freetown), developing appropriate codes and regulations about land use, and providing a range of training programmes on how to effectively integrate climate change.

## **7.12 Summary and Conclusion**

This chapter has highlighted that decisions about planning in Sierra Leone are dominated by sectoral tendencies. It has shown that although the MLCP&E has responsibility for managing planning and the environment in Freetown, certain historical peculiarities in the laws relating to each of these sectors have made it difficult to integrate matters relating to the two domains. This is likely to present a difficult context in which to make climate change concerns an integral part of planning decisions. This is owing to the limitations it will pose to collaboration between the two sectors. The chapter has further shown that the limited space created for local level roles (particularly for the FCC) in planning decisions, and the disjointed ways in which physical development activities are carried out in Freetown may have played significant roles in the worsening vulnerability in Freetown. It explains that development in Freetown has been chaotic because nearly all the planning laws are not only old-fashioned, but also, inadequate and poorly enforced. This is reinforced by the cumbersome nature of the planning procedures, the inappropriate standards for housing development, and the inadequate capacity for planning in both the MLCP&E and the FCC. These limitations have made it difficult for the planning and management process of Freetown to adequately cope with the city's growing population pressures. This finding confirms the central argument that whilst urban planning may have the potential to considerably minimise the disastrous effects of climate change, the existing framework and processes for planning in Freetown (and by extension, Sierra Leone) do not provide the right climate for integrating climate change issues. Since the current management processes for climate change are also not sufficiently robust, owing largely to the blurred nature of the mandates and inadequate capacities (Chapter Six), there is a need to reform and align the way the two processes are administered. This recognition is at the heart of the framework which this study proposes for making climate change concerns an integral part of urban planning decisions (see Section 'B' of Chapter Eight).

## Chapter Eight

### Discussion on the Challenges and the Way Forward

#### 8.1 Introduction

The main focus of this chapter is to provide answers to the fourth research question – what are the key challenges to making climate change concerns an integral part of urban planning decisions in Freetown and how can the gaps be resolved? In the last three (analysis) chapters of this study, attempts were made to address this question by discussing the overall evidence gathered, each chapter covering a different major aspect but without showing how the results relate to each other in such a way that inferences could be drawn. The purpose of this chapter is therefore to integrate these strands of reflection in order to draw out the important findings and lessons learned. The chapter will also demonstrate the relevance of theory to the research findings in addition to proposing a framework for integrating climate change issues into urban planning processes. As highlighted in the first chapter, the main goal of this study has been to examine the practicality of incorporating climate change concerns as an integral part of urban planning processes, in an attempt to offer a new contribution to knowledge in this area.

#### 8.2 Section A: Urban planning and Climate Change- The Challenge for Integration

This section discusses the important issues that have emerged from the analysis chapters in relation to the relevant theoretical strands examined through the literature review (Chapters 2 and 3). An important aspect of this discussion is to highlight how the findings of this research either agree with or differ from existing knowledge. Critical to this discussion is the suggestion of clues about what may have contributed to the societal constraints upon individual and organisational behaviour – both material and non-material elements. The discussion commences with an overview of the main climate change concerns for Freetown that should be taken into account in urban planning decisions.

### **8.2.1 What are the key climate change concerns for Freetown?**

The primary challenge to urban planning in Freetown is the widespread vulnerability which has made many settlements in the city highly susceptible to the adverse effects of climate change. In Freetown, vulnerability has been produced through a combination of topographical and socio-economic conditions, as well as through the institutional processes which determine both access to resources (land, income, services and infrastructure) and the kinds of development that are meant to be allowed. As pointed out by Fussel (2007) and Romero-Lankao and Dodman (2011:116), vulnerability is unequally distributed and it has been expressed in several places in the form of socio-economic deprivation and the prevalence of unsafe living conditions. Vulnerability is high because several settlements have developed chaotically and without regard for the regulations relating to land use planning. While the regulatory structures forbid any unapproved development in Freetown, the inability of low income groups to access land in the inner city owing to its high cost have forced many to flout these strictures. This is particularly widespread in a number of unsafe areas along the coast and hills where climate-related disasters are more frequent. Further adding to these areas' vulnerability is that, in addition to their unsafe location, the housing conditions in these areas are generally poor owing to the unaffordability to those who construct them of standard building materials. Vulnerability is further exacerbated by appalling drainage and infrastructural systems, including the inadequate services provided.

Whilst it is clear that hazard frequency and intensity in Freetown have increased in the last decade, no significant effort has being made by governments to improve the infrastructural condition of these areas. Apart from budgetary constraints, one possible reason for this inaction is a lack of knowledge on the part of both central and local governments regarding the exact number of people and settlements that have developed in the hazard-prone areas. This is because no comprehensive study has been carried out on this issue at the city scale. Furthermore, as yet not much is known about the current and future impacts that climate change will have on Freetown. The reason for this is that apart from the limited research that has been carried out, very limited data exist for Freetown concerning its local climate as well as its local socio-economic characteristics. This can be attributed both to poor documentation and to the sheer dearth of data. Data on weather conditions is limited because no 'operational' weather station has existed in Freetown over the last decade. This has made it very difficult to reliably predict expected changes in climate in order to inform

urban planning decisions. One consequence of this is the weak adaptive capacity at household level, as numerous households are neither aware of existing disaster risks nor of future climate changes that will occur. Another area of weakness is the low participation by residents in community decisions.

Some institutional factors that have arguably influenced vulnerability in Freetown relate to poor enforcement of building and planning codes and high levels of poverty and inequality. Since poverty and inequality influence the possibilities (resources and capacity) open to households and communities, they have worked to limit their capacity to cope. Vulnerability is therefore high because of the societal constraints which people face, as exemplified by the lack of access to land, overcrowding, lack of early-warning systems, inadequate access to urban services, and the low adaptive capacity. As low income groups are the dominant occupiers, dwellings in these settlements have rarely been constructed with any consideration for climate change. The settlements continue to develop in this way due to population pressures on the city and the inability of many households to gain better housing conditions.

Some of the predicted impacts that climate change will have on Freetown have been discussed in Section 5.7. Other consequences will include the inundation of the low-lying areas along the coast, the erosion of beaches and the intrusion of salt into aquifers. The cause of many of these problems relates to the current and predicted changes in climate which are expressed in the form of longer dry seasons and shorter but more intense wet seasons (McSweeney *et al.*, 2008). This may cause water resource problems and habitat and biodiversity loss. The rise in forest clearance for building construction and the uncontrolled felling of trees for charcoal and firewood may lead to the intensification of runoff, which is already a major source of flood risk (Douglas *et al.*, 2008; Scholze *et al.*, 2006). Climate change impacts will differ widely between settlements based on their current and future state of vulnerability. Settlements that threaten the greatest possibility of climate change impacts are those that are already located in hazard-prone zones (low-lying coastal edges, escarpments) with poor drainage and sanitary conditions, and with inadequate resources to defend their dwellings from climate-related events. This result thus confirms earlier findings from a range of scholars (Romero Lankao and Qin, 2011; Satterthwaite *et al.*, 2007; Tipple, 2006; Schilderman, 2004; Adger *et al.*, 2003) that physically-unstable areas are especially vulnerable because the poor and marginalised people who normally live there lack the resources and the capacity to adapt. The lack of

defensive structures in such places to protect the poorly-built houses, which can be sources of livelihood and income as well as shelter, makes them highly vulnerable to climate change. These findings are not surprising, given that even in the absence of climate change, it is these same settlements that have always had to endure the recurrent floods and landslides that occur. On the basis of these findings, it can be conjectured that the consequences which climate change will have on these settlements will arise not so much from the potential changes in climate themselves, but more from the existing level of vulnerability of the individuals and their locales (Corfee-Morlot et al., 2011; UNFCCC, 2008: 10).

With regard to mitigation, a key challenge for planning is the lack of adequate information about key GHG emission sources in Freetown, as well as about the actual contributions they make. Information is lacking because no clear inventory exists of Freetown's production enterprises, transportation systems, built environment, and various energy consumption sources which are very critical to the city's emission status. Freetown lacks an emission inventory regardless of the general recognition that it is at the local level that emissions take place. Nonetheless, it was found that CO<sub>2</sub> is the main GHG emitted in Freetown. The road transport sector produces the most carbon in Freetown because of the high demand it makes on fuel oil. Emission from this sector is high because the sharp increase in vehicle importation and ownership has generally consisted of old and used vehicles. This trend is expected to rise by 2025, with serious implications for fuel efficiency measures. The country's high poverty level and its low tariffs on old and used vehicles have been the main driving force. Other causes relate to the city's high traffic congestion, caused by the chaotic way in which development has occurred.

While it has not been possible to access data on emissions from electricity consumption in Freetown, it is clear that a significant proportion of the city's households depend more on charcoal and wood fuel. This has led to a steady rise in CO<sub>2</sub> emissions from this source. Emission from charcoal and wood fuel use is expected to grow, owing to the country's high poverty levels which limit people's access to electrical energy, as well as to poor and irregular power supplies. An interesting finding was that because the bulk of houses in Freetown are constructed from cement and iron rods, they already have a lot of energy embedded in them. This energy level is expected to rise with climate change as more heat is absorbed from the rising temperatures. However, by comparison with global and sub-

regional totals, CO<sub>2</sub> emission in Freetown is largely insignificant. This is because most of the businesses which use power from electricity sources are generally small-scale. Also, in spite of the current rise in motor vehicle importation in Sierra Leone, CO<sub>2</sub> emission from this sector remains insignificant. On this basis, it has been argued that it would be more practical for Freetown to prioritise adaptation, since (as a nation) Sierra Leone will be more of a victim than a perpetrator of climate change.

### **8.2.2 The climate change management process in Sierra Leone**

This study has analysed the climate change management process by looking at the roles, as well as the policy and regulatory structures, of a number of organizations involved in climate change management in Sierra Leone. The management process was found to be very complex and blurred, with the four bodies that drive the decision making process each tending to assume leadership. This highlights how the lack of a clear legislative framework and the lack of clarity in organisational roles can impede actions to effectively address climate change. As was highlighted in Chapter Six, one reason for this complexity is that the body of law on environmental management in Sierra Leone neither refers specifically to climate change nor defines the specific roles that different organisations should play in dealing with it. Moreover, even though the CCS was set up as the country's 'designated authority' for climate change, its mandate is not legally binding, since it was never enacted in legislation. The only body that was legally constituted, although not directly for climate change, is the Technical Committee (SLEPA Board membership). However, because its main agency (SLEPA) is bound by other sectoral duties, which renders its role in climate change management only a secondary one, the other bodies (CCS, MD and MLCP&E) have usually tended to assume leadership.

This lack of an institutional structure appropriate for managing the various activities to be carried out when the climate change integration phase eventually commences may have implications for urban planning. This is in view of the constraints it will present to the intersectoral discussions that will be needed, including the way climate change knowledge will have to be produced for inclusion into planning decisions. These constraints will likely be aggravated by the isolated decision-making processes that characterise the key divisions of the MLCP&E. On the basis of these constraints, it can be assumed that this same divide, which has long impeded the embedding of environmental protection issues

into urban planning processes, will remain one of the biggest challenges to making climate change concerns an integral part of urban planning decisions.

In terms of policy and regulatory issues relating to the management of climate change, it is interesting to find that to date, Sierra Leone has no specific policy or legislation on climate change. Although some of the country's leading legislation on the environment and planning encompasses a range of specific issues which relate to climate change, nearly all these laws were made long before climate change was problematised in Sierra Leone. They are therefore neither sufficiently adequate and nor robust enough to effectively respond to most of the emerging challenges that climate change presents. Worthy of note, however, is that even the most recently enacted environmental legislation (the SLEPA Act of 2008) fails to make any specific reference to climate change – which is, in the circumstances, a remarkable omission.

Nevertheless, two important international ratifications were found to have had a significant influence on climate change management in Sierra Leone, namely the Kyoto Protocol and the UNFCCC. These two treaties have provided not only the framework for most of the climate change activities that have been carried out, but they have also accentuated the role of the UNFCCC in the management of climate change in Sierra Leone. This relates to the support this body provides to Sierra Leone (a non-Annex 1 acceding country), due to the commitment it has thus far demonstrated in implementing the accords. However, this support has mainly been in the form of discrete projects, such that once a project expires, the climate change response-drive also slows down until another project is introduced. As a result of this support, the representations of climate change by the UNFCCC/GEF/UNDP seem to have taken precedence. This framing has had a significant influence on the way the country's response strategy has been structured. Because actions addressing climate change are framed and pursued mainly at the national level, nearly all the knowledge that exists has been gathered at this level, with rarely any consideration of the critical challenges which climate change will have on Freetown. It is not that no actions having a bearing on climate change are taken at this level (by households, community groups etc.); but rather, that such actions, pertaining to climate change, are not deliberately and systematically planned. Most of these actions, such as the various coping strategies used by households and community groups and the tree planting activities organised by the FCC, community groups and NGOs, are not only disjointed but also, modest in scope.

### **8.2.3 Why the divisive approach to managing urban planning and climate change?**

Climate change issues in Sierra Leone are still not considered in urban planning decisions and processes. This is in spite of the country's long involvement (since 2003) in climate change issues and of the fact that both the Environment Division, which has responsibility for managing climate change, and the Planning Division, which has responsibility for regulating land use, are still under the management of the same ministry (MLCP&E). As discussed in Chapter Five, one difficulty which has presented an enormous challenge to integrating climate change issues in urban planning decisions relates to the traditional boundaries that have long existed between the planning and environment sectors. This boundary, which is the result of the separate histories of the way each sector has evolved, is reinforced by the isolated policies and laws which each sector has continued to follow. Thus, even after they were merged into the MLCP&E as part of the government's attempt to develop an organised approach to dealing with the country's problems through the promotion of sustainable development issues, both sectors have still tended to work in isolation. This is because despite the amalgamation that took place at the organisational level, the regulatory laws, plans and cultural practices in the two sectors were never reviewed. From an institutional standpoint, the boundaries have persisted because of the differences in what each sector has come to consider as the institutionally accepted rules and behaviour that should be followed. Several scholars (Delmas and Toffel, 2004; Scott, 2001; Tenbrunsel *et al.*, 1997) have shown that individuals and organisations conform to particular styles of action, since such behaviour leads to legitimacy. Thus, the pressure which these taken-for-granted rules have imposed on individual behaviour has caused them to continue to address organisational issues separately, in spite of the difficulties they present to the government in meeting its intended objectives.

At the national level, where all the country's planning and environmental policies and laws are made, sectoral approaches have been prioritised owing to Sierra Leone's long history of centralised administrative practice. The social and cultural pressures imposed at this level have caused policies and regulations to be sectorally designed, since the actors who structured these laws had to follow what is defined as appropriate in an institutional sense. In Freetown, the consequence has been a lack of a clear focus on local level issues, since sectoral decisions have always taken primacy over local level considerations of what specific interventions should be carried out. Moreover, because the planning system is still

characterised by the regulatory role of the state, and underpinned by the comprehensive planning regime (Altshuler, 1965), it is rarely open to the cross-sectoral actions needed to address climate change issues in the city. Consequently, each sectoral actor has tended to follow the taken-for-granted behaviours and actions that they have become accustomed to pursuing. As Tenbrunsel *et al.* (1997) observed, institutions lock individuals and organisations into a mindset of compliance with what is considered to be the most acceptable mode of practice. This sectoral approach, as reflected in the single problem-single solution approaches pursued by the range of sectors, confirms the findings of earlier OECD studies (1996: 51-52) that a large part of the problems which cities face are due to a lack of foresight in the design and implementation of development interventions. In Freetown, this is because of the inappropriate structures that exist for dealing with the complex and interlocking nature of the problems that the city faces.

#### **8.2.4 The state of urban planning in Sierra Leone**

As emphasised in Chapter Seven, one of the biggest challenges faced by planning in Sierra Leone are the complex ways in which the various institutions involved with the planning and development process in Freetown have been organised. This arrangement has had implications for the way power is divided between national level institutions and those at the local level. As pointed out in that Chapter, the MLCP&E, which sits at the central government level, is traditionally responsible for all urban planning decisions in Sierra Leone. This is owing to the overarching authority that it has over the control and development of land. Although the FCC (municipal government) also has responsibility for planning in addition to the provision and maintenance of the city's urban services and infrastructure, its planning role has not been fully recognised. This thesis has presented two major findings to account for this, which relate mainly to the way the institutional environment for planning has been structured.

The first finding is that even though the FCC was retained at a time when all other local councils in Sierra Leone underwent dissolution in 1972, it was feared that by allowing it to retain its planning and development control powers, it would be difficult for the central government to fully achieve its centralisation goals. It was therefore considered practical for all such powers to be transferred to the central government in order to consolidate its legitimacy. One consequence of reversing the FCC's role in planning decisions about

Freetown is the extent to which unplanned development has increased in the city. This has been caused in part by the *ad hoc* ways in which land use decisions have been executed. Another consequence has been the elevation of sectoral decisions in the development of Freetown, with each sector tending to operate separately and independently of collaboration with the MLCP&E and other sectors (especially the FCC) at the local level. What has worsened the conditions of Freetown is the manner in which the city's infrastructure and services have been allowed to deteriorate.

The second finding is that even though the 2004 Local Government Act has required the MLCP&E to transfer some of its planning roles to local councils (including the FCC), it has continually found difficulty in complying, because giving up such roles is seen as amounting to a loss of power and hence of legitimacy. Many scholars (Mahalingam and Levitt, 2007: 525; Delmas and Toffel, 2004; Beckert, 1999: 791-792) have argued that whilst it is important for organisations to attain legitimacy, it is the institutional environment that determines how it is both attained and exercised. In Sierra Leone, the weak regulatory systems for planning have allowed the MLCP&E with its insufficiently restricted powers to hinder the active role of the FCC in decisions about the development of Freetown. This has been reinforced by its unwillingness to devolve important planning functions to the FCC, even though this reluctance has also been partially attributed to lack of capacity (skilled staff and resources) at this level. Hwang and Powell (2005) have shown that the institutional environment is critical to organisations' success since it defines and limits the opportunities open to them. Accordingly, the limited space that the institutional environment had provided local councils within Sierra Leone has resulted in the elevation of centralised decision making processes over local level considerations in planning decisions.

Being predominantly focused at the national level, most of the planning activities of the MLCP&E have rarely taken into consideration the local knowledge of the very people for whom plans are made. This is because planning has usually taken place outside any participatory process. While planners are expected to collaborate with those who will be affected by plans (Agger and Löfgren, 2008; Healey, 2003; Healey, 1998), and specifically, to broaden the knowledge base on which decisions are made, the taken-for-granted norms that have pervaded Sierra Leone's planning process have not allowed this. This partly reflects the dominance of centralised decision making processes in the country, a characteristic that makes the MLCP&E very unwilling to collaborate with other actors on

planning issues. What is surprising, however, is that urban planning-related decisions are also made by various other bodies (Ministries, agencies and utility companies) which are not required to collaborate with the MLCP&E. This disjuncture is aggravated by the lack of coordination between the constituent departments of the MLCP&E which are the country's key policy decision making bodies for land use controls, planning and the environment. Arguably, the lack of an organised purview of Freetown in terms of developing longer term shared strategies to address the challenges which climate change will present is at the heart of the key vulnerabilities which Freetown will continue to face.

Other challenges arising from Freetown's demographic and socio-political processes relate to the rapid growth of the metropolitan population, in spite of the city's weak infrastructural provisions. The rise in the Freetown population is important in particular because of the sustained pressure that this exerts on existing urban services. Although faced with this reality, and despite developing its land policy in 2004, Freetown has yet to formulate a clear land use plan to guide its future growth process.

### **8.2.5 The problem of unplanned development**

As indicated in Chapter Seven, one of the foremost reasons for the unplanned development of Freetown is the lack of a specific policy guiding the way the city should be developed. Several of the policies and laws which have variously influenced the way Freetown has grown were never designed with such goals expressly in mind. The only policy regulations that were specifically designed to influence this growth process relate mainly to the 1946 TCPA and the Freetown Improvement Act. Because many of the laws used were designed without adequate consideration of the other regulatory context, they have created a difficult climate for the collaboration of institutions in developing Freetown. One major difficulty which these laws present for the city's development process is the limited consideration they give to the wider problems relating to the city. Because these laws have usually focused either on a specific or a partial aspect of the city's problems, they may have accounted for most of the differences that were observed among communities in terms of how vulnerable they are to climate change.

While the existence of planning laws could have helped to significantly reduce the growth of unplanned development in Freetown, three major limitations were observed which may have led to the poor implementation of planning rules. The first is that, because the Act

(1946 TCPA) which establishes the enforcement of development controls did not provide any punitive measures for cases of non-compliance, it is very difficult for planners to enforce its provisions. The ambiguity created by this gap has also become a major source of abuse by various classes of people (planners, politicians and the elites) who do not want to see it resolved. The second constraint relates to the cumbersome processes involved in the planning approval process which make many people less willing to adhere to the existing rules. As the current practice shows, most people, rather than wait until approval has first been secured, go ahead with construction work before making a planning application. A similar finding was also observed by Madanat *et al.* (2006) in a recent UN-Habitat study on Sierra Leone. The third limitation relates to the inappropriately exigent standards prescribed by the Freetown Improvement Act for housing development. As the study shows, the emphasis which this Act laid on the use of manufactured materials in housing development merely worked to price a large proportion of the city's low-income earners out of the housing market. This is due to the high costs at which manufactured building materials are sold in Sierra Leone. These factors, together with the low capacity for planning in the MLCP&E, have led to the proliferation of squatter-like settlements inhabited largely by low income earners, who mostly rely on the use of locally-sourced materials for housing development. Vulnerability in these areas has therefore been reinforced by the massive shortfall in housing supply which has led to the prevalence of land grabbing, as people look for any opportunity to own their own house.

An important feature of this type of growth is the rise in development sprawl. Although sprawl has afflicted nearly everywhere in Freetown, it is more active in the eastern and western extremities of the city. This is mainly along the low-lying expanse of land that falls between the peninsular hills and the coastal margins. The linear configuration in which the city has tended to spread is due to the obstructions caused to its outward growth by the ruggedness of the Peninsula hills. Sprawl has been exacerbated by the increased pressure that is exerted on Freetown's limited land area due to the continued growth in the city's population. The most recent national census (2004) indicates that Freetown concentrates between 19 to 25% of Sierra Leone's estimated 40% urban population and that its share of this population total will continue to rise in the foreseeable future (World Food Programme, 2008; Koroma *et al.*, 2006; Statistics - Sierra Leone, 2006). Population growth will reinforce climate change impacts on Freetown because of the pressure it will exert on the city's limited land space (8,100 ha) (Hoekstra, 2010), as demand for land and

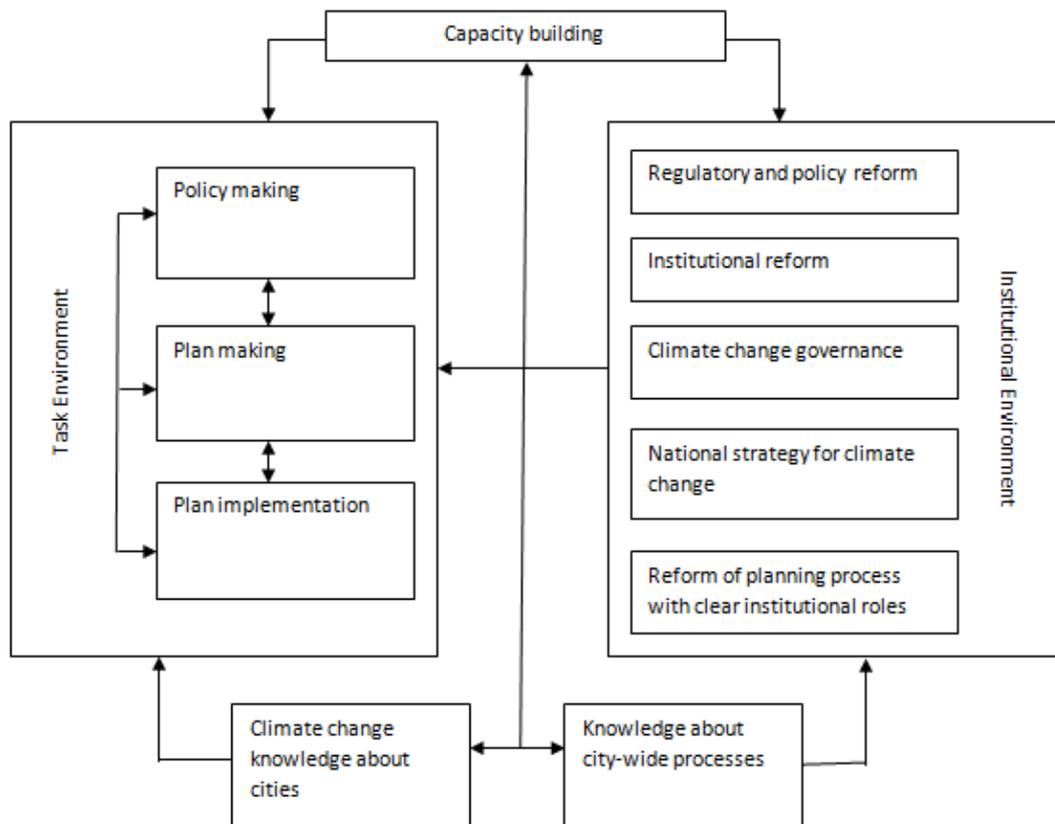
housing increases. This will have implications for the city's ecological systems because of the damage it will cause. Already, Freetown is challenged by a massive deforestation of the surrounding woodland, with extensive construction works going on in the peninsular hills. These activities have not only intensified climate hazard occurrence but have already altered the quality of many of the city's habitats and led to the leaching of soils.

### **8.3 Section B: The Way Forward**

The previous section in this chapter has highlighted and discussed some of the important findings of this study including the key lessons learned, and how they relate to the existing theory. This section will now attempt to provide answers to the principal research question: how can climate change considerations be integrated into urban planning decisions in Freetown? In taking this discussion forward, it should be noted that the thoughts represented here are not presented as a blueprint, since the way urban planning processes are likely to respond to climate change in cities will vary according to local and institutional contexts. This does not however reduce the relevance or applicability of the evidence to situations other than Freetown, where the knowledge was produced.

#### **8.3.1 A framework for the climate change integration process**

In order to clearly illustrate how climate change concerns can be integrated into urban planning decisions, a schematic framework has been developed to provide insight into how institutional rules and behaviour can be modified in order to enable urban planning roles. As shown in Figure 18, this framework has been designed based on four components that embody the institutional and contextual environment. The first component, which symbolises the local context, relates to the kind of knowledge (about climate change and city-wide processes) that planners actually require, since not all the effects associated with climate change can be adequately addressed through the planning process. For example, while planners may decide on where to construct roads in cities, it is outside their mandate to determine the type of vehicles (new, used or old) that are allowed, including their emission levels. This implies that planners and other actors need to be provided with clear and reliable information on climate change that is sufficient to meet their organisational needs.



**Figure 18: A framework for integrating climate change concerns in urban planning decisions**

The second component concerns the institutional environment for both planning and climate change. Because this component sets the rules which shape individual and organisational actions, it therefore provides the framework for the various activities that occur. For that reason, it is important for any meaningful integration process to have this environment modified in order to make it more enabling and supportive of planning activities. The third component of the model, the “Task Environment” reflects the notion of “institutions of governance” as put forward by Williamson (1998: 26-29). Since it is this component that shows how the rules set by the institutional environment are actually followed, it is here that the integration process should take place. The last component of the model emphasises that capacity building will be a major factor, not only in providing the required knowledge for planners, but also in enabling both the institutional environment and the task environment. In this regard, it is argued that poor cities of the

developing world, which lack the requisite capacity to integrate climate change issues in their planning decisions, would need to be supported in carrying out this role.

The next sub-section will now develop a detailed discussion of each of the key issues that makes up the framework. It will start with a brief overview of the drawbacks in producing climate change data in a developing country context.

## **8.4 Climate Change Knowledge in a Developing Country Context**

In line with the UN-Habitat (2009) and Yuen and Kong (2009: 7), one of the key ideas in this thesis relates to the argument that to minimise the adverse effects of climate change, knowledge about its likely impacts on cities should be integrated in urban planning decisions. Yet as the Freetown case shows, this has proven very difficult. One main reason for this shortcoming relates to the limited knowledge that planners and city authorities have about the way climate change is likely to affect the city. This lack of knowledge presents a difficult challenge to the future development of Freetown, since the planning decisions that are made today are bound to have implications for the future growth of the city. This raises important questions about how data on climate change can be reliably produced for use in urban planning decisions and processes. In the sense that it has been used throughout this thesis, climate change knowledge consists mainly of a reliably determined inventory of information about both the current and future changes in climate. This includes both the causes of the change, and the potential effects it will have on human and socio-ecological systems.

### **8.4.1 Urban planning and climate change: what knowledge to integrate?**

Three of the principal questions that would need to be asked in order to integrate climate change concerns in urban planning decisions are examined. The first question can be stated as follows: **what kind(s) of climate change knowledge about cities do urban planners need?** To ensure that urban development is climate change-aware, urban planners need information about the spatial processes that drive GHG emission in cities along with knowledge about the variety of ways in which settlements will be impacted by climate change. With regard to the latter, planners need to know specifically what weather patterns (high precipitation) and events (frequent floods, heat waves) are likely to arise from

climate change and who or where is likely to be more vulnerable to what event and how. Nevertheless, in Freetown as with several other poorly-developed cities of the world, this knowledge is either not available or is still very limited. As the literature shows, a variety of techniques (Risk Assessment, Global Circulation model etc.) have been used globally to assess both GHG emission levels and the impacts climate change will have on cities. Some of these methods have undergone significant refinement, with many new assessment approaches still evolving. These have all been in an attempt to provide an improved understanding of climate change impacts to enable the identification of better mitigation and adaptation measures.

The CVI used in this thesis is one such measure that has been developed to provide urban planners with the information about cities that they need. This study has argued that for cities with hardly any effective systems for collecting climate data or for downscaling climate change predictions to the city level, the CVI offers a relatively effective means to inform planning decisions about climate change. The output of the CVI can for example, provide useful information on the relative differences among settlements in their vulnerability to climate change, the main vulnerability drivers, and the categories of people or urban infrastructure that are likely to be affected by climate change. Such information can be presented for planning purposes in many forms including maps or databases. This can guide planners to make analytically sound judgements in their prioritisation of interventions in a context of scarce resources. This argument for CVI is particularly true for Sierra Leone, where despite the frequency and severity of hazards in Freetown, vulnerability assessments are still sectorally-based with no specific focus on the city as a whole.

While predictions of climate change at the national level are the most frequently used knowledge basis for addressing climate change in many places, it should be noted that such knowledge not only masks differences between regions (Agrawal, 2008: 13), it also conceals important details concerning climate variability at the local level. Information about variability in climate, even between settlements with similar levels of development, is important to planning because it is such differences that usually account for the different ways and extents to which climate change impacts settlements. This thesis argues therefore that because climatic hazards occur within specific places (towns, communities), it is important to undertake place-based vulnerability assessments for use in planning decisions. This would therefore require local community knowledge about vulnerability as perceived

by the very people whose lives and livelihoods are most affected by current changes in climate. Analysis involving academic researchers, professionals and community participants which is focused specifically on providing answers to ‘how’ and ‘why’ access and entitlements to resources (land, income, services) differ among social groups and over time and space, will be more useful for planning decisions, since these participants can provide quality data about the planning context.

Place-based assessment that accentuates local community knowledge is necessary because, even as much of the climate change impact in cities will tend to be hazard-related, the adverse effects may not be driven entirely by the hazard risk itself. As the Freetown case shows, numbers of people living in extreme poverty already experience various forms of deprivation relating to access to land, urban services and infrastructure. These facilities are important to enhance human livelihoods and hence limit the ever increasing levels of vulnerability that populations are exposed to. Yet as Reid and Satterthwaite (2007) have noted, settlements that have occurred in unsafe areas face great difficulty in getting city authorities and planners to remove the vulnerability that they face. This vulnerability, which exposes people to injury, loss of assets, even premature death, is at the heart of the challenges with which urban planning should concern itself. This thesis asserts that because of their altruistic culture, planners will arguably be interested in having valid information about the city in terms of who or what is vulnerable, where and how?

**What specific processes in the city do planners need to know about that would increase their understanding about how climate change threats are accelerated?**

Understanding of the key processes operating at the urban scale which work to either increase or minimise the adverse effects of climate change in cities will increase planners’ knowledge about climate change. As has been discussed in this study, among the important processes which have driven vulnerability in Freetown are the rapid and unplanned growth of the city’s population, along with the consequent spread of informal development. These two processes and the way they interact with the rise in poverty and inequality in Sierra Leone are arguably more prevalent in Freetown than they are in any other part of the country. The way these processes work either to intensify GHG emission levels or to worsen vulnerability in cities needs to be properly understood by planners. Also of significance is the need to understand how best to harness such processes for a potential role in climate change adaptation and mitigation. In doing this, planners must, however, be very mindful about how their decisions might inadvertently lead to maladaptation.

**What adjustments ought to be made to current planning processes to enable the integration of climate change concerns in urban planning decisions?** Climate change is likely to affect various places and people in different ways, based on differences in the scale of their vulnerability. But as many scholars (Friedmann, 2005; Farvacque-Vitković *et al.*, 1992; Mabogunje, 1990) have shown, there is already a wide gap between the understanding embodied in urban planning approaches (based on the master plan) and the actual concerns faced by individuals. Even in contexts like Freetown, where the urban development planning<sup>13</sup> approach is sometimes used, the participation of users in planning decisions has not been adequately guaranteed. Planning processes need to be made more flexible and interactive to accommodate local level realities, with valuable inputs about the vulnerabilities and risks that exist. This should involve adapting planning decisions to directly reflect the local knowledge of individuals, groups, and communities in the various settings where development activities are to be carried out (Coburn, 2003: 421). Decision-making processes ought to be made more proactive with most of the activities going far beyond the mere enforcement of rules relating to land use planning and development control. They should be built on issues of public awareness regarding the potential damage caused by climate change and the need to prevent or reduce the extent of such damage. This emphasises the need to collaborate with the various other actors who are involved with the built environment, including the urban sector. Intersectoral and trans-disciplinary approaches to urban sector development, where issues affecting the city are looked at collectively with academic and non-academic knowledge merged together, can work to reduce vulnerability and emission levels at very minimal costs. Such an approach will require policy actors to view every policy issue affecting the city as a cross-cutting issue which may have implications for various other actors in the city system. This suggests the need for any climate change integration process to be adequately informed about how urban planning decisions are made in any given context. There are contexts where it is already customary for planning interventions to be made based on intersectoral decisions, relating to such sectors as the environment, transport and disaster management. Given the

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<sup>13</sup> Mabogunje notes that Urban Development Planning was developed by the World Bank as an alternative planning approach to cities due to the drawbacks of master-planning. This new approach was to shift attention away from land use planning to a focus on the financing of specific projects aimed at stimulating growth in the city's economy. Central to this approach is Action Planning.

level of capacity and awareness that they have already developed, such contexts seem to be more advanced in making climate change an integral part of their planning processes.

### 8.5 The Institutional Environment

The issues that have been examined in Section 8.4.1 suggest the need for a robust and supportive institutional environment as a key requirement for integrating climate change issues in planning decisions (see Figure 19). The key attributes of this environment and the specific actions that are needed are now discussed.

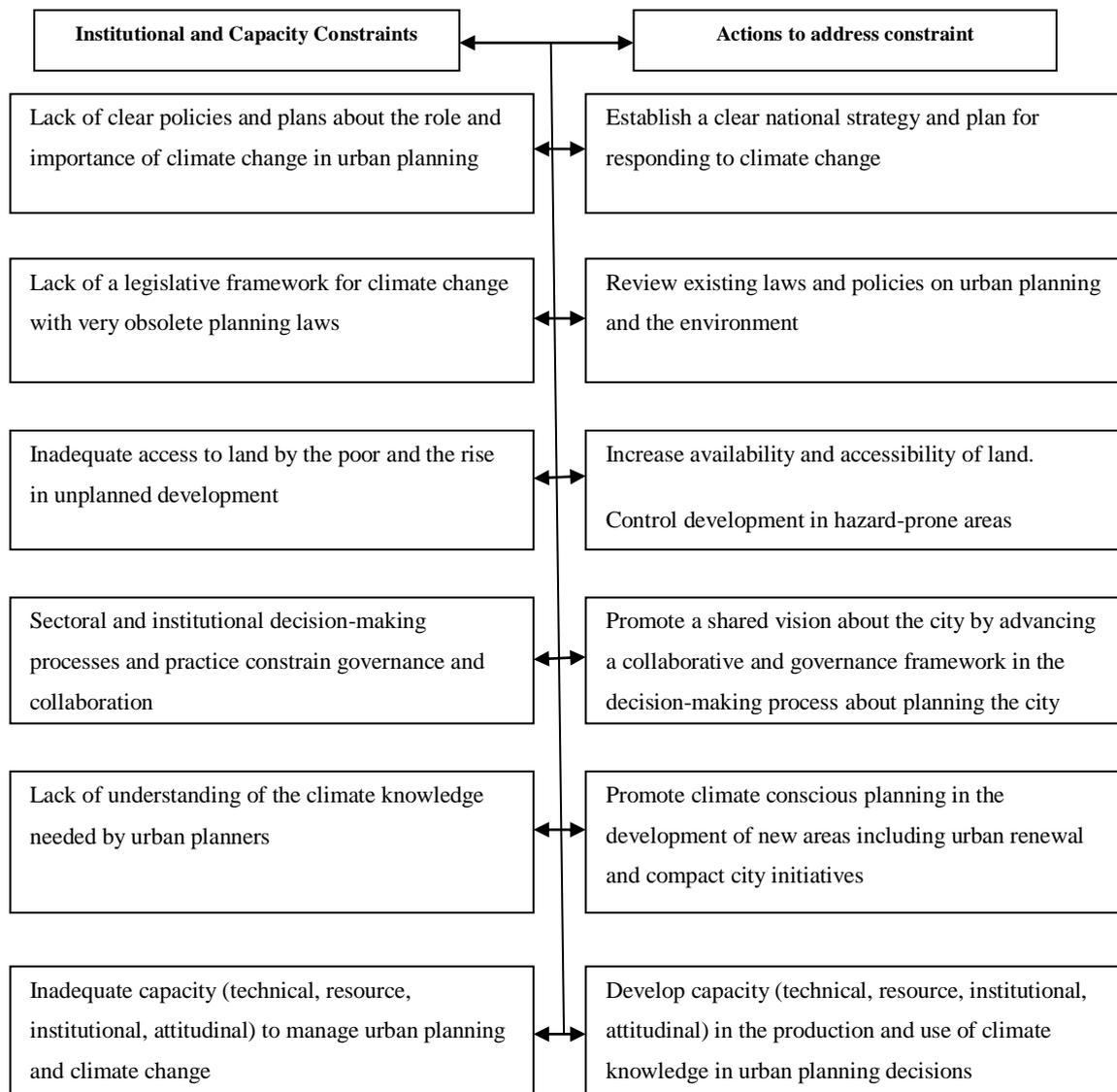


Figure 19: Actions to reduce institutional constraints in climate change integrated planning

### **8.5.1 National climate change response strategy**

A national climate change response strategy is essential for making climate change issues an integral part of planning decisions. This is because such a strategy recognises climate change issues as cross-cutting concerns which have implications for several other sectors of government. It therefore emphasises the importance of planners adopting an organised approach to dealing with the different climate change concerns, rather than addressing them disjointedly. A national response strategy is critical to the integration process because it underscores the need for the various planning and climate change actors to coordinate their efforts in ensuring that responses are made more effective. It also provides direction on how to integrate climate change and the various response actions that should be taken at levels from the community to the national. Consistent with this logic, this thesis considers that national strategies that require organisations to align their climate change response actions with other priorities of government (poverty reduction, health and sanitation, infrastructure and services) are more likely to engender support to minimise negative impacts. It is also important to recognise the need to involve different organisations at levels from the community to the national in an attempt to increase the quality of the decision making process (Corburn, 2003) and to enhance the applicability of the result (Tress *et al.*, 2006).

In view of the negative effects which climate change will impose on Freetown, this thesis considers that the CCS, which already has experience liaising with the various sectoral actors, is better situated to drive this strategy. This role would involve coordinating the climate change activities of the MLCP&E and the FCC, in addition to the activities of the various other sectoral actors. It would also entail enabling inter-sectoral linkages on some key cross-cutting issues. The CCS should ensure that all the integration measures used in planning decisions are well thought-out, that they have less likelihood of leading to maladaptation and are carried out with full consideration of the potential implications they will have for other sectoral activities. The strategy should place greater emphasis on adaptation issues, since vulnerability rather than cutting GHG emissions is the major challenge faced by Freetown. However, the government must step up its current efforts at harnessing renewable energy sources as well as protecting the forest reserves which serve as CO<sub>2</sub> sinks. Several other mitigation measures have already been suggested in the country's National Initial Communication. As a result of the funding difficulties that

enable the country to implement only the more important policies on adaptation, there is need for the government to start generating resources locally.

### **8.5.2 Legal and policy issues**

As might be expected, the laws and policies which relate to urban planning and development control need to be modified to reflect the particular concerns presented by climate change. This is to ensure that they are made more robust and apt to support the range of mitigation and adaptation activities needed to address climate change problems. Many scholars (Agrawal, 2008; Romero Lankao, 2008; Satterthwaite *et al.*, 2007) have argued that cities with the highest capacity to deal with climate change are those with clear and robust policies and laws which allow planners to effectively shape the way such settlements have developed. An enabling policy and regulatory framework is essential to the integration of climate change because it provides direction about how the actions should take place. This is, however, not present in Freetown since the important laws that relate to planning are not only old but are also less rigorous, and out of keeping with the current challenges faced by the city.

Moreover, because these laws which ought to ensure the effective planning and control of the various land uses in Freetown are not properly applied, it is important to reform and upgrade them in order to make them more responsive. This will involve, for example, identifying and expunging from the planning legislation the specific rules or standards that impose barriers upon the poor's ability to access land and housing in cities. The need to reform current policies on land is in particular very critical because of the prospects it presents for reducing the spread of squatting and other kinds of informal activities. Reforms will also involve restructuring and simplifying the systems for land registration along with the validation of titles since this has the potential to give confidence to households in investing in their own safety. It is unlikely, however, that in the short term any specific legislation will be enacted concerning climate change in Sierra Leone that clearly sets out broad objectives along with the specific activities that are anticipated by the government. Nevertheless, the current legislation about the environment can be amended to address the specific concerns for the country raised by climate change. This similarly applies to any new legislation that will be made relating to planning or the environment.

### 8.5.3 Institutional reform

Reforming planning processes and the way planning institutions are organised is an important step for integrating climate change. The reform of institutions is essential because policy and legislative changes alone are unlikely to guarantee climate change-response actions if not supported through the appropriate institutional frameworks. Recent studies, however, indicate that most of the institutional reforms that facilitate climate change have merely focused on either the modification of structures or the setting up of new ones. Because the workforce has been largely ignored, very little success has been made in making institutions robust enough to deal with the numerous challenges related to climate change. Institutional reform should involve not only changes to the formal structure, but changes in the attitudes and beliefs of the workforce. It should aspire to win the support and confidence not only of the persons working in planning institutions but also of the personnel in the many other organisations that they interact with. One way of gaining the support of the workforce is to create greater awareness about the adverse effects that climate change can cause and the need to avert its potential damage. In the case of Freetown, the CCS is, arguably, the most appropriate body to play this role since it is in possession of the required information about climate change that can be disseminated to the public.

The management and decision-making processes also need to be restructured to make them simpler, more inclusive and straightforward. It is noted however that whilst institutional reform is critical for the integration of climate change, it does not guarantee what actually happens in practice, since planning processes are affected by a range of factors. Nevertheless, reform is essential to invigorate the way institutions are run, particularly in making planning decision-making processes more proactive in the face of climate change. This thesis considers that while reforms are urgently required in the MLCP&E, which is the central government ministry responsible for planning, the main focus should be the FCC, which is responsible for delivering the basic services to city dwellers. This is because of the potential it has to make a huge difference to people's lives, since it is the main local government body and closest to them. Also, because local priorities may not necessarily be the same as those at the central government level and given the differences that exist among communities in terms of their needs, it is also important to secure the participation of local people. Failure to include the local

community in planning processes which seek to deal with their vulnerabilities will result in adaptation actions that are chaotic (maladaptation).

#### **8.5.4 Reform of institutional role**

The earlier chapters have identified complex institutional structures as one of the key challenges to integrating climate change issues in planning decisions. This thesis considers however that even where planning systems in Sierra Leone are to undergo revision, the statutory role of the MLCP&E needs to be retained. This is because of the guidance and direction that it provides to urban planning and development control issues. The MLCP&E should, however, develop clear national climate change-response plans and guidelines with appropriate guidance on how local councils and other bodies at the local level can deal with the impacts. It should also collaborate with the CCS to develop capacity within these institutions by providing them with the relevant climate change knowledge and skills that they need. The two bodies can additionally work to source funds or undertake research in a bid to increase understanding about the vulnerability of settlements, in addition to investigating the main GHG sources in the city.

The CCS will continue to act as the repository and disseminator of information about climate change. This will include any empirical knowledge in the form of conference papers, research findings, reports, journals, text books and training materials. It can also serve as a suitable link between national level actors and those at the local level. It is important that the CCS maintains a strong relationship with the various actors deemed critical in addressing climate change. Such actors should be identified at all levels, from the community to the national, and in ways that are unambiguous. The CCS can work with such bodies to develop a national plan on climate change which accentuates the government's key policy objectives. Moreover, because of its role as the designated national authority for climate change in Sierra Leone, the CCS should serve as the main body, with statutory powers for coordinating all the different response activities carried out by the various actors. The CCS should additionally have responsibility to source funding and other forms of technical assistance for actors at the different levels. These should include the FCC, which would be tasked with embedding and putting into practice actions that address climate change.

### **8.5.5 Improving co-ordination**

Integrating climate change in urban planning decisions requires deliberate actions to coordinate the activities of the range of organisations affected by climate change. Coordination is needed to reconcile the different organisational priorities and policies along with the range of interests that exist at different levels of state. In Freetown, the first step towards improving the governance framework for a more effective climate change integration process is to remove the traditional boundaries that have hitherto made it very difficult for climate change issues to be incorporated in planning decisions. This will involve the reordering of the complex relationships among the various organisational actors in addition to synchronizing the many sectoral policies which relate to the urban sector.

Coordination is required mainly in three different forms consisting of vertical coordination, horizontal coordination, and internal coordination. Vertical coordination is needed at the level of central government, where the MLCP&E exists as the highest body responsible for the control and use of all land spaces in Sierra Leone. The MLCP&E would be required to collaborate with the CCS in order to provide the various actors with the relevant climate change knowledge that they need for inclusion into their respective policies and activities. The MLCP&E should also provide them with the relevant guidance on how to improve their inter-sectoral relationships. The MLCP&E should, however, ensure that the climate change concerns that it chooses to integrate and the measures it uses do not compromise the concerns of other actors at levels from the individual to the national. This would require the various actors to work in collaborative ways, through dialogue between and among the various organisational memberships.

On the other hand, horizontal coordination will be required among the various service providers and the FCC, which is set to take over responsibility for the planning of Freetown. The FCC may also coordinate with the Western Rural District Council at the regional scale, since the administration of certain areas of Freetown falls directly under the latter's jurisdiction. Coordination at this level offers an opportunity for the actors to share climate change knowledge in addition to holding discussions about the specific concerns that preoccupy the various bodies. It can provide a useful platform for learning, whereby actors who lack the appropriate skills and knowledge about integrating and dealing with climate change are provided with the requisite capacities through learning from others.

Internal coordination is, in particular, a crucial requirement for any effective integration process, given the poor coordination practices that were observed to subsist between the three units of the MLCP&E. This can be carried out by promoting a shared goal or vision for planning amongst the various units, such that any new proposal or plan that is to be developed is made to fully reflect this overarching ideal. Internal coordination presents significant prospects of enabling the Ministry to overcome the sectoral leanings of its various departmental heads (Lands and Surveys, Town Planning, and the Environment) who have usually carried out their roles separately. Other partners for collaboration include the transport, energy, water resources, and forestry sectors. By collaborating with the transport sector in particular, urban planning can work to reduce GHG emissions in Freetown. This partnership would be critical to the future development of the city, because of the potential it has to reduce congestions and the emission of GHG's. This is because the transport sector is now one of the fastest growing areas of the economy.

#### **8.5.6 Capacity Building Issues**

As Yuen and Kong (2009) have shown, the planning system of cities is characterised by diverse capacities which determine the level of vulnerability which people face. In the case of Freetown, the key capacity constraint to the urban planning process relates to complex institutional arrangements, the inadequate budgetary allocations, and the outdated planning legislation. This is reinforced by insufficient skills and lack of coordination among the MLCP&E, the FCC and the various other bodies responsible for urban development (see Figure 19). Capacity building is essential to help planners develop the relevant structures and tools needed in order to make the planning process more robust and responsive. It is also critical for enhancing the role of the MLCP&E and the FCC in tackling climate change. Capacity is needed to ensure that planners are able to productively combine their planning competences with climate change knowledge in order to produce sustainable urban outcomes. It is also required to enable planners to integrate climate information about cities with other data relating to land uses, future processes, and urban renewal. However, developing capacity in urban planning alone is not enough, since the people whose lives and assets are exposed to harm are often locked out of the planning process, with hardly any access to urban services including the land and property market. People's limited access to these facilities has caused the intensification of vulnerability, which now forms one of the greatest challenges facing urban planning.

Central to the capacity building process is the need to increase the public's awareness about the potential impacts of climate change. Awareness is needed to speed up actions in halting the negative impacts of climate change, especially in poorly-resourced cities where services and infrastructural development are weak. Awareness will also be required among politicians and policy makers about the future impacts that will occur if the present climate change concerns are not addressed. In many contexts, this will involve envisioning the future and scenarios of alternative futures to provide politicians and policy makers with a clear picture of the overall climate change problem and emphasising the need to 'avoid failure'. In the case of Freetown, the CCS is well placed to facilitate awareness because of its current position as Sierra Leone's designated national authority for climate change. While the MLCP&E and other actors would have to firstly rely on the current capacities existing within their respective bodies, their officers will also require training on contemporary strategies for managing climate change. The CCS should therefore be in a prime position to carry out capacity assessment of the various establishments at the different levels of state in order to determine the actual needs that exist. Capacity building programmes can be developed in the form of various courses that either focus on specific issues or that meet the individual needs of organisations. To sustain this process, capacity can also be developed within the universities and colleges, involving training in a range of skills that relate to climate change and sustainable development issues. Consideration needs to be made also about ways to improve on existing knowledge. Research programmes that are based on interdisciplinary studies are particularly critical in identifying opportunities for collaborative responses that are grounded on 'win-win' strategies. Research programmes need to be encouraged on issues that offer potential national benefits. The emphasis should be on producing information about the potential climate change risks, so that the relevant sectoral actors can make more informed decision on how to address them. Building capacity through increasing collaborative actions with NGOs, local groups and organisations, and enhancing the operational capacity (building knowledge and skills, and providing resources) within these groups and communities, will also be an important step.

## **8.6 The Task Environment: The Climate Change Integration**

### **Process**

In conjunction with the regulatory, governance and institutional reforms is the need to embed the relevant climate change concerns within the planning decision making processes. It must be emphasised however that because planning processes are likely to differ among countries based on how they are institutionally structured within their varying local contexts, there can be no one way of doing this. Nevertheless, it is important to carry out the integration process at the different levels of state, from the local to the national. In this analysis, however, no strict distinction is made between national and local level actions because, as in the case of Sierra Leone, countries tend to differ in terms of the particular level where planning decisions and activities actually take place. This framework is therefore only intended to provide an insight into how climate change concerns can be integrated in planning decisions, and also to help identify opportunities for advancing the process. Three key stages are identified here as crucial to integrating climate change concerns. These stages include policy making, plan making and plan implementation.

### **8.6.1 The Policy Making Phase**

The policy making phase, which normally coincides with the national level (where the planning ministry exists as the overarching body responsible for the framing and enforcement of all policies relating to land use and physical planning) is particularly crucial to the integration process. The policy phase not only highlights the government's broader objectives for planning but also gives an indication of what specific activities that should be prioritised. It therefore provides an important opening for integrating climate change concerns.

Most countries may already have in place policies and regulations relating to physical and land use planning. However, a number of cities, such as Freetown, may continue to lack any specific policy and regulation on how to manage land use and the overall development process (development plans). Policies and regulations are important for integrating climate change, since the processes involved in the planning of land use as well as infrastructural development in cities need to conform to existing rules. For this reason, it is important at this level to clearly establish the need for planning processes to take consideration of

climate change issues. Making such a policy declaration can support the allocation of adequate resources to facilitate the integration process. In several contexts, this may involve expanding the scope of the planning process from a narrow focus on land use management issues to other broader urban objectives. It will also require planners to make their own evaluation of the existing policies, plans, codes and laws to determine their suitability or otherwise for tackling climate change. In such cities as Freetown where development plans and urban sector policies are not yet in place, the existing national plans and legislation can still be maintained as key policy frameworks. It is nevertheless important to apply a 'climate lens' in their application, pending the preparation of a more suitable policy. Linking climate change-response planning policies and laws with other broader national policies and objectives can reduce costs and the possibilities of maladaptation.

### **8.6.2 The Plan Making Phase**

Integrating climate change concerns at the plan making stage is important, since urban planning deploys land use and development plans as the basis for promoting development within cities. Plans can be made either for the city itself (by the local or national government) or for the urban region (by the national government), depending on how the processes in the city and that of the hinterland are linked. Integrating climate change in plan making should involve the participation of various individuals, groups and organisations, taking a holistic view of the city in terms of the key challenges which climate change will present. This will involve a strategic planning process whereby concerns about land use planning and climate change, as well as other important concerns regarding the city's growth process, are looked into in order to produce a common view that represents its future state. Collaboration between the central government planning authority, the local government, the Meteorological agency and the Disaster Management office is particularly important at this stage. If these organisations provide planners with reliable data about the current and future changes in climate, including the key climatic disasters that may result, it will be possible to make decisions on land use and development controls in ways that can avert disaster incidents. It is, however, important to base such planning decisions on a detailed assessment of the prevailing vulnerability and how this will change over time. Such knowledge can also be valuable in informing decisions about whether or not relocations would be required and how this should be

addressed. It will also involve looking at the land tenure systems to see what changes can be made to reduce vulnerability in cities.

In Freetown, integration at the sub-national level would also be needed, since as discussed earlier, various central government agencies and departments carry out a range of planning decisions that have implications for the city's development process. Climate change should be made a central part of the organisational goals and policies of most of these bodies, along with their strategies and performance measures. Organisations can effectively integrate climate change concerns into their respective plans by developing a clear understanding of how their planning and development processes will affect, or are likely to be affected by, climate change. As climate change issues are relatively new to Sierra Leone, it can be expected that some organisations will face difficulty in incorporating them into their work. It is important that guidelines are provided by the MLCP&E on the kinds of policies and strategies that should be developed, as well as how to measure performance. Regulatory provisions that specifically require such bodies to respond to climate change may influence the preparatory activities that they undertake.

At the local level, the FCC can integrate climate change concerns into its local land use plans by developing codes that promote the ideals of the compact city approach. Such measures as mixed land use, incentives to use public transport, regeneration of inner cities, and the promotion of other forms of non-vehicular travel which have proved appropriate in reducing GHG would also need to be included. Other activities that could also be included relate to the conservation of green areas; the identification of at risk places and sectors; developing appropriate adaptation strategies; facilitating community adaptation actions; and supporting educational programmes on climate change. It is important for the FCC to directly link the local plans with existing plans at the national level. This is to ensure that local level actions are in broad harmony with the country's set goals for dealing with climate change. The FCC should be able to draw support from the central government for certain of the activities it undertakes, given its low budgetary resources.

### **8.6.3 The Implementation Phase**

Plan implementation can actually take place at any level of state. At the local level, planning strategies needs to be developed that explicitly focus on dealing with climate change. Guidelines should also be provided on how municipal governments, local

communities and the private sector should go about implementing plans. A focus on the three principles underlying the compact cities approach, that is, mixed land use, transport linkages, and quality services delivery, may help to shape the future development of cities. This will focus specifically on limiting growth in unsafe areas, whilst at the same time working to reduce the need for long distance travel. The success of this approach will, however, depend on whether or not climate change is made a priority issue in urban planning policies and the activities of the municipal government. In Freetown, the sub-national level is considered to be very critical in taking actions to address climate change because of the important role that state agencies and departments play in promoting development in the city. These organisations can begin to think about the roles they should play in reducing climate change impacts. Yet even where these bodies may express willingness to take action, they often do not have the legal authority to make such decisions independently, since they are under the supervision of various other Ministries. This therefore emphasises the need for an organised approach to cities based on inter-sectoral and inter-organisational actions, whereby the activities of organisations are coordinated so as to transcend institutional boundaries.

At whatever level that actions are taken, plan implementation ought to be based on the use of a climate lens, as proposed by the OECD (2009). This involves an analysis of the implications in relation to climate change of the proposed measure (policy, strategy, plan or programme) that is to be carried out. The key considerations that need to be taken into account are: (i) the extent to which a particular planning intervention is likely to be affected by climate change; (ii) what specific climate change risks need to be taken into consideration and why; (iii) how might the planned activity increase GHG emissions or worsen vulnerability, with implications for maladaptation; (iv) what important opportunities arising from climate change might be missed by not carrying out an alternative planning action; and (v) what important lessons learnt from previous planning activities might be useful in dealing with new or similar situations?

## **8.8 Summary and Conclusion**

Climate change can be integrated in the various activities related to urban planning and is required for most of the development activities that takes place in cities. Yet the framework developed here is mainly for government (national and local) and other public

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sector bodies that take decisions relating to the development of cities. It is, however, acknowledged that governments acting alone will not be able to effectively address the numerous climate change concerns for cities, since to do so equally requires that the community, along with other non-state actors, should play an active role. The rationale for focusing on government here has been to keep the scope of the research within achievable limits, and to allow detailed examination of the key areas where policy and strategic decisions are made.

## Chapter Nine

### Conclusion

#### 9.1 Introduction

Making climate change issues an integral part of urban planning practice is a challenge that faces most cities fraught with frequent and severe climatic hazards. Yet, whilst efforts to promote a shared vision to address this challenge are now well advanced in a number of cities in the developed world, in the least developed countries many cities are yet to initiate action. Regardless of the numerous factors that underlie this discrepancy, there is a growing trend in climate change literature for scholars to make assertions about how climate change concerns for cities should be addressed, without considering the specific locational and institutional contexts. This study has aimed to contribute to this debate from the perspective of cities in developing countries, by going beyond the dominant discourses to engage with the role institutions can play in shaping and constraining the creative aspects of human action. That much of the academic literature has continually conceptualised climate change only in terms of mitigating GHG emissions and their likely impacts without much thought for the influence which countries' internal institutional configurations may exert is indicative of the academic tendency to "think within the box", be that a cultural, geographic or disciplinary box. The predilection to ignore institutional issues is not surprising giving that most researchers have always assumed institutional 'appropriateness' when discussing actions to deal with climate change. For many, their purblind approach is shaped by a limited understanding about how climate change actions will interact with a country's policies and laws to shape or constrain the way climate change considerations are addressed.

By examining both the factors which drive and condition climate change impacts on Freetown and the contingent conditions which shape how the city's planning responses are made and executed, this work has confirmed the importance of institutions in addressing climate change, especially when integrating adaptation and mitigation responses in urban planning decisions. It thus underscores the importance for any planned action dealing with climate change to reflect this reality. This work has emphasised that institutions matter, since they provide the channel through which urban planning responses to climate change

are conceived and carried out. Therefore, the institutional architecture for planning needs to be better understood in order to effectively integrate climate change concerns in urban planning processes in practice. This does not, however, mean that actions (to integrate) must be delayed until after the planning institutions have been set in order.

Having discussed (in Chapter Eight) the interlocking issues that were pulled together from the various analysis chapters (Chapters Five to Seven) of this study, this final chapter reaches its conclusions by first re-engaging with the research questions to show how the aims and objectives which have directed this work were followed through to its findings and conclusion. The chapter will also reflect on the research experience as well as making some relevant suggestions for policy and further research. The chapter concludes with some final thoughts on the theoretical basis of this research and on the significance of increasing the impact of urban planning in addressing climate change issues.

## **9.2 Back to the Research Question**

This study has questioned the tendency for most of the climate change literature and relevant theory to characterize climate change mainly in terms of the concerns it presents to cities. It highlights that because the integration of climate change actions depends upon urban planning institutions, it is important that such institutions are better understood. A key step in illustrating this relationship was the identification of a framework to show how this interaction works and how urban planning institutions interrelate with city-wide processes to increase or reduce GHG emissions and local people's vulnerability. The embedded case study approach, whereby more detailed examination of selected sub-units takes place alongside the broad inquiry of the case study, was therefore considered appropriate to provide a holistic understanding of the institutional constraints of climate change-response planning.

Analysis at the city scale was accomplished by examining the way institutions interact to shape vulnerability and GHG emissions, as well as the response actions taken (Chapter Five). This entailed looking at the institutional framework for making decisions about climate change (Chapter Six). Also explored were the various legislation and procedures for planning (Chapter Seven). Analysis at the sub unit scale was accomplished by examining the different contexts of hazard occurrence and the unsafe conditions that make particular communities more vulnerable than others (Chapter Five). Triangulating the data

collected from all the different data sources was important for evaluating the different claims and for validating the research. Assessing the institutional environment was essential for providing an understanding of what it is about the context that will enable or constrain the integration of climate change concerns. This therefore required the use of a case study design that is based on the critical realist approach, to provide an understanding about the causal factors that both drive and condition climate change in Freetown and how the city's planning responses to that impact are both shaped and constrained.

By using a mix of data collection methods (which reflect both the qualitative and quantitative research traditions) this study collected 'rich' data from a number of data sources. Two data sources were particularly critical for this study. The first involved institutions at both the local and national levels which either have urban planning or climate change as their direct mandates or have sustainable development or disaster management as part of their mandate. The data collected focused specifically on the management processes of urban planning and climate change, the planning and environmental policies and laws, and the decision-making and communication processes within and between the institutions studied. The second data source was information gathered from household heads selected from the four embedded cases. The data collected here related to households' awareness of climate change, perceptions about individual risks and exposure, reasons for individual vulnerability, response strategies, and level of community organising. Whereas data from the former was drawn mainly from documentary reviews, and interviews with a number of key officials at both the state (national and local) and non-state levels (private and community sectors), the data for the latter was collected using surveys, focus groups and direct observations. A key aspect of the data at the household level was an assessment of the state of vulnerability at the individual and community levels.

The use of multiple methods of data collection for this study was to reduce bias, on the basis that by using methods that draw from both qualitative and quantitative techniques, the limitations associated with the separate use of either of these two research approaches will be largely overcome. The methodology, however, focused more on unravelling the causal processes that intensify vulnerability and the contingent conditions which shape the way decisions about planning responses are made. While the respondents' perspectives were key to this study in terms of the knowledge they provided about the case, including the research phenomena, it was never seen as the ultimate truth since due to their

differentiated realities, they can never fully know which specific processes possess actual explanatory powers (Hoffmann, 2005; Willig, 2001: 3; Sayer, 1992). Their perspectives were, however, very valuable in achieving the research aims and objectives and for opening up new areas for further research. For this reason, they arguably provided the impetus to examine the causal processes which underlie the climate change concerns for Freetown and the contingent conditions which both shape and constrain the climate change management and planning response processes. Each of these issues will now be examined.

### **9.2.1 The climate change concerns for Freetown**

Investigating the climate change concerns for Freetown was the first objective of this study. This objective was achieved by carrying out an investigation of hazard trends and intensities, as well as the contingent conditions which make particular places more vulnerable to the existing impacts. Also explored were the key GHG's emitted in Freetown, the main emissions sources and the potential climate change impacts for Freetown. The main findings here were first, that no evidence exists about any assessment ever being made for Freetown concerning GHG emission levels, nor of the nature and spread of climate change vulnerability, nor of the potential impacts that climate change will present. Secondly, it was found that even though no separate GHG emissions inventory exists for Freetown, Sierra Leone's total emission level is very insignificant by comparison with the sub-regional and global average. Thirdly, it was found that vulnerability in Freetown is generally very high in many of the unstable settlements where most of the low income groups with poor services and inadequate infrastructural provisions concentrate. Fourthly, the research found that most of the impacts which climate change is likely to have on Freetown settlements fall within the remit of planning.

The study has however established that while methane is Sierra Leone's most emitted GHG, CO<sub>2</sub> is the more widely produced gas, with Freetown being a key source. The energy, manufacturing and construction industries had previously been the principal source of this gas but the transport sector is now taking the lead. It is, however, difficult to establish the actual GHG's emitted in Freetown, owing to the lack of an emissions inventory. The nonexistence of such important information from the varying data sources demonstrates the lack of capacity in several of the city's core establishments with regard to providing the kinds of knowledge required to deal with climate change. The country's low

emission level, however, suggests that adaptation activities should be prioritised in the various urban planning responses to tackling climate change. This does not, however, reduce the important role that mitigation can play in responding to climate change.

In Freetown, vulnerability differs widely between settlements, with unsafe areas (which are rarely planned and which also lack the required protective cover, services and infrastructure) being the most susceptible areas. The intensification and spread of vulnerability is associated with the continued urbanisation of Freetown and its wide-ranging deficits in infrastructure and urban services provision. Vulnerability is exacerbated by the absence of any clear urban strategy to manage the urbanisation process of Freetown and the consequent pervasiveness of informal settlements. These settlements have proliferated because the planning regulations which ought to guide and control the city's development process are generally old and restrictive, with most of their provisions no longer appropriate for dealing with the current problems. Farvacque-Vitkovic *et al.* (1992: 63-64) have highlighted these issues as being among the key planning challenges faced by many countries in the developing world. Yet, these institutional capacity issues have been largely ignored in much of the climate change literature, with several of the discourses focusing only on dogmatic prescriptions, and rarely offering any guidance on how to achieve them. One important factor which may have led to the spread of vulnerability in Freetown is the lack of collaboration among the various bodies charged with urban planning and development responsibilities in Freetown. Collaboration is lacking in spite of the consequences that interventions made by particular bodies present to others.

Climate change will present a wide range of impacts for Freetown (see Section 5.7). Most of these, however, fall within the remit of planning practice. Impacts will be worsened by the city's already huge adaptation deficit, as well as its exposure to further changes in climate. Individuals and their settlements will be differentially affected based on their individual exposure and vulnerability. The key determinants here will be location, topography, access to resources, level of climate change knowledge, level of community organising and social capital. Impacts will be higher in informal settlements such as slums, as well as other unstable settlements where urban services and infrastructural provisions are lacking. These settlements have mostly occurred along coastal edges where sea level rise is predicted to be severe and along the peninsula escarpment where flood water flows are more frequent. It is in these very places that low-income groups, who are generally priced out of the city's land market, tend to settle.

### **9.2.2 How supportive is the existing framework for climate change management**

As its second objective, this study sought to investigate how the existing structures that administer climate change support the integration of the relevant concerns in urban planning decisions. To accomplish this objective, Chapters Five and Six investigated the way climate change has been problematised in Sierra Leone, the key response activities carried out at the national level, the nature of the management structure and the factors that will enable or potentially constrain the integration of climate change issues in urban planning processes. The study found firstly, that the framing of climate change in Sierra Leone has been strongly influenced by the UNFCCC/GEF/UNDP and that this representation has determined the way climate change response actions have been undertaken in the country. The second finding was that even though Sierra Leone has no specific law on climate change, there are a number of other important laws in the country which apply to some of the main concerns associated with climate change. These laws are however very general in scope. The study found thirdly that the current management framework for climate change is very problematic because it is very complex and blurred, with the decision making process being limited to only a few groups, existing mainly at the national level. Fourthly, it was found that there are already an immense range of institutional and technical constraints which will potentially hinder the identification of climate change concerns and their integration in urban planning decisions in Freetown.

This study has demonstrated that framework conditions such as the existence of a climate change policy, a clear definition of roles, an inclusive governance framework, and a strong capacity (technical, institutional and resource) are very crucial for tackling climate change. The absence of such important structures may have allowed the UNFCCC/GEF/UNDP to pioneer Sierra Leone's climate change management process, with the government being entirely reliant on them for providing the required support and for the formulation of strategies. The initial importance these strategies assigned to mitigation issues limited climate change responses to the national level, thus ignoring concerns such as vulnerability and climatic hazards which may be more important in the Sierra Leone context and are more pervasive at the local level. In this regard, one important argument which has been reflected throughout this work is that, because climate change presents different challenges to different countries and places, it is important that policy responses reflect this fact. Other reasons for the limited responses at the local level relate to the lack of appropriate

climate change knowledge and capacity among households and (local-level) organisations, and the complexity of the current management framework (for climate change). The management process is fuzzy, because no specific institution is assigned an outright mandate for dealing with climate change issues.

One consequence of concentrating the climate change management framework at the national level is the lack of inclusiveness of local level actors, since apart from a number of government ministries and agencies that are involved at the national level, no evidence of involvement by local organisations was observed. The exclusion of voices at this level may have influenced earlier decisions about prioritising mitigation issues over adaptation responses in the country. This work has identified a number of capacity constraints characteristic of the different institutions that have responsibility for addressing climate change and for overseeing or integrating climate change concerns in their planning decisions. These constraints which have been examined in Sections 6.10 and 7.11.3) have validated the research argument - that whilst it is easy to urge countries to integrate climate change concerns into their planning decisions and processes, it may not be possible to do so if the institutions responsible for providing the relevant climate change knowledge, and for embedding such information into their decisions, are not fit for purpose.

### **9.2.3 The state of urban planning institutions in Freetown**

Examining the state of urban planning processes in Freetown and the specific forces that will shape the way climate change concerns are integrated into planning practice, was guided by the third research question. The question focused mainly on investigating the country's planning practice as it relates to Freetown and a number of important documents which guide the way the country's urban planning processes takes place. In doing so, specific attention was given in Chapter Seven to an analysis of the policy and legislative framework as well as the institutional arrangement for managing urban planning activities in Sierra Leone. Four key findings were identified which are worth discussing here. The first was that urban planning and environmental management (under which climate change issues are addressed) have traditionally been seen as two separate fields in Sierra Leone, and this has presented barriers to integrating the two processes. The second finding was that whilst a number of policy instruments exist for the planning and development of Freetown, they are mostly applied in very *ad hoc* and uncoordinated ways. Related to this

is the third finding, that owing to the poor capacity of both the MLCP&E and the FCC, coupled with the cumbersomeness of the planning application process, planning rules are neither effectively enforced nor adequately adhered to. The fourth finding was that the rapid growth of informal settlements owing to the increased urbanisation of the city has coalesced with housing and infrastructural scarcity to intensify the vulnerability of many areas to the threats posed by climate change.

This study has shown that the historical, structural and contextual conditions of countries can present unique challenges for planning in tackling climate change concerns in cities. In Freetown the main historical challenge relates to the narrow way in which the 'environment' has been traditionally conceptualised in Sierra Leone (in terms of forest management). An important consequence of this framing was to marginalise a number of other important environmental considerations which now characterise climate change. Even after environmental issues regained prominence in the 1990s, the extended absence of a holistic understanding of its actual meaning resulted in the fragmented development of diverse sectoral policy plans with limited attention given to the potential effects that climate change will present in the country. Most of the recent studies undertaken to establish the potential impacts of climate change have been focused at the national level, with rarely any analysis made at the scale of Freetown. The lack of clear knowledge about climate change impacts for Freetown and of a mandate for the MLCP&E to integrate such concerns into its planning decisions has led to the lack of attention given to such issues in urban planning practice. Planning processes in Sierra Leone are still very old-fashioned, with to date no substantial review taking place of either the 1946 TCPA or several of the other applicable policies and legislation. Consequently, there is a considerable knowledge gap between the existing forms of planning and the types of approaches needed to address climate change.

Freetown's planning and development decisions are taken and executed through a variety of institutions which rarely collaborate with the MLCP&E and the FCC. The approaches used are mainly sectoral, and there is only limited consideration about the effects which such actions may have on the activities of others. The sectoral policies and laws which support such actions are found to differ substantially, with each sector focusing on either a specific or a partial aspect of the city's development problems. Part of this problem relates to the lack of a specific policy about how the urban sector should be managed.

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This study has provided sufficient evidence to indicate that the population of Freetown has grown much faster than the capacity to plan for its spatial development and to provide the physical infrastructure needed to support its growth. Decades of underinvestment in urban services and infrastructure have coalesced with the damage caused to the city's infrastructure during the rebel war to aggravate the vulnerability of whole settlements to the current variations in climate. The literature review revealed that this vulnerability has been further deepened by the current increases in population growth that climate change will exacerbate. Increased population growth accounts for the proliferation of informal settlements in Freetown. Many other researchers have attributed the growth of these informal settlements in part to the massive capacity gap that exist in both the MLCP&E and the FCC. The initial cause of the departure of several of the country's professionals was the insecurity caused by the civil war. Yet the low public sector wages and the poor conditions of service have continued to sustain an exodus of professionals long after the war was ended. However, a number of measures to build capacity in the two institutions, with bilateral support, have recently been initiated.

The planning situation in Freetown has shown that the persistent call in most of the climate change literature for planning to address climate change concerns in cities has given little attention to the huge capacity gap and the contextual conditions that are required for cities to take up the challenge. While the consistent assumption of capacity is based on a wide sample of cities across the globe, most studies have focused on cities where planning has an overriding influence over urban development. Thus, there is limited information in the literature on cities where planning has far less authority over how development proceeds in practice. As a result, there is a considerable gap in the evidence about the capability of planning processes to effectively tackle climate change across the full range of cities, based on different levels of development. Thus the available evidence implies a strong similarity in capacity, irrespective of the size, level of development and the degree of planning consciousness of the city. This research has provided an alternative view and thus helped to fill a gap in the existing knowledge.

## 9.3 Discussion of Contribution to Knowledge

### 9.3.1 Is the planning system fit for purpose?

As was pointed out in Chapter One, the main thrust of this work has been to question the dominant assumptions of ‘institutional fit’ that permeate the climate change literature about urban planning roles in tackling climate change impacts. To do this, the research has explored the relevant theories in order to develop an appropriate conceptual framework that best represents the important ideas emerging from the literature. This framework was necessary since it provided the basis for the investigation that ensued, which tested current knowledge. As reflected in the study findings, this work has made two important contributions to knowledge. This has been in an attempt to provide new insight into some of the little-understood structural issues that impede urban planning from consciously taking action to deal with climate change. The first of these contributions has built on the growing number of works which seek to explore more effective and efficient ways of making planning institutions more responsive to the threats posed by climate change. It has specifically done this by taking the debate forward from a less-developed country context to show that whilst urban planning can play important roles in reducing climate impacts, the extent to which this is possible is highly dependent on the structural constraints which institutions present. This relates to the quality of the policies, laws, and decision-making processes, as well as the institutional environment. Institutions matter since they provide the framework through which climate change is problematised. It is through institutions that planning responses will also be conceived and carried out. The vital integration of a number of climate change concerns for cities is dependent on the actions of planning institutions, and thus it is important that actions to tackle climate impacts are explored beyond the limited focus on adaptation and mitigation issues. Tackling climate change necessitates making the responsible institutions ‘fit for purpose’. This therefore requires policy makers, city authorities and scholars to unravel the structural and technical issues which either facilitate or impede response.

In Freetown, the consideration of climate change issues in urban planning is constrained by a number of structural factors. These relate to the huge capacity deficit (in terms of technical skills and resources) for undertaking both urban planning and climate change management in the city, as well as the dated and toothless nature of the planning laws and regulations that exist. While there is always potential for human agency to change matters,

so far, these forces have coalesced with other contextual factors to constrain human ingenuity in taking actions to deal with climate impacts. These structural issues now form part of the vulnerability faced by Freetown. The climate change literature which recognises institutional roles in planning has only rarely focused on how institutional forces interact with city-wide processes to enhance vulnerability to climate change. Gilbert (cited in Gupta *et al.*, n.d. post 2008: 1-2) has demonstrated that unlike human and global climate systems which are in a constant state of flux, change in institutions is more gradual. In Freetown, the poor state of planning institutions, owing partly to the lack of process reforms, has exacerbated the spread of unplanned development with grave implications for vulnerability to climate change. These institutions, as represented by the existing policies, laws, administrative instruments and techniques, will also create barriers to integrating climate change concerns into planning. In essence, the way structural constraints interrelate with other forces in cities to limit urban planning roles in responding to climate change as presented in this study has rarely been recognised in the climate change literature.

While these constraints will differ across countries and their cities, it is important for any planned response action to reflect this reality. Some critical questions that any meaningful response process will need to bear in mind would, for example, include: what structures exist for urban planning – are they very supportive of climate change? Are the policies, laws and rules robust enough? Is there any clearly formulated strategy for managing climate change, and how can the response actions be carried out in more coordinated ways? Addressing such questions requires a shift from dogmatic assumptions to directly engaging with the institutional capacity constraints of cities. Such engagement offers great potential to enhance the role which urban planning can play in tackling climate change. Central to this is the identification of the likely complementarities and tradeoffs between climate change policies and the various other aspirations of government.

### **9.3.2 What climate change knowledge is required for planning?**

The second contribution relates to the identification of the types of climate change knowledge about Freetown which ought to be considered when making decisions about urban planning. In Freetown, information about the actual vulnerability that exists and the impacts which climate change will have on the city is largely unavailable. Also unknown

is the city's actual contribution to GHG emissions including the principal sources of such emissions. At the same time, the role which institutions play either in aggravating vulnerability and emissions or in constraining responses at levels from the household to the city are equally unclear. The lack of clear knowledge among planners about the effects which climate change will have on Freetown is therefore a major constraint in ensuring that the city's physical and spatial planning processes are based on climate change-conscious decisions. Regarding the acute scarcity of climate data that was observed for Freetown, this work has emphasised that in contexts (as in Freetown) where there is inadequate capacity to identify climate change concerns for planning decisions, the idea of limiting such assessments to a specialist domain at a higher level than urban planning needs to be reconsidered. It is argued that because climate change issues in urban settlements are also about the promotion of sustainable development ideals within cities, they therefore fall within the remit of planning and this reality needs to be recognised.

Planners can work with the very people who are susceptible to climate change, to identify the at-risk areas of the city, including the various processes that account for their vulnerability. Where such knowledge is developed based on the use of a suitable vulnerability assessment approach, it can be very valuable for policy making. This implies that planning decisions need to be devolved to the local level, whereby local residents can be given more control over the decisions that affect their lives. By focusing planning decisions at the local level, planners can be provided with insight into the multitude of factors acting both to deepen the vulnerability which people face, as well as limiting their capacity to act. Those accounts which have recognised the role of planning institutions have nevertheless rarely focused on climate change issues, at least in the developing country context, where the capacity for planning and managing climate change issues is still very weak. This work emphasises that just like individuals and households, countries and cities face distinct challenges, which account for the different capacities they demonstrate in addressing climate change. While climate change is likely to reinforce these challenges (as exemplified by the institutional capacity deficits in the case of Freetown), it is important to come up with more concrete answers about the ways that institutions can be redesigned to support actions to address climate change. Obviously, such strategies are bound to differ across cities. In the case of the least developed countries, one way of achieving this is to broaden planning roles from a mere focus on the spatial pattern of land use, including the different kinds of development that take place, to

ensuring that the social, economic and environmental processes of the city are kept in balance. This requires planners to be recognised as having key roles in the various processes for assessing the vulnerability and impacts of climate change, as well as in moderating emission sources and drivers in cities.

## **9.4 Some Comments for Planners, City and Climate Change**

### **Managers**

There has been growing recognition of the role which urban planning can play in limiting the effects of climate change on cities. Yet because much of the climate change literature has emanated from a natural science background (Gupta et al., n.d. post 2008), only the task environment (what cities ought to do) has been considered, with responses generally based on technological issues. While the legal, administrative, resource and capacity constraints which characterise the institutional environment are now increasingly being considered, only a few works have looked at this from an urban planning perspective. Understanding the constraints which such institutional forces as planning regulations, codes and bylaws impose on climate change response actions in cities is empowering, since it provides policy makers with clear knowledge about how these forces shape organisational success. This involves examining the values and norms of the planning administrative machinery and the technical and policy issues which both enable and limit individual and collective (including inter-organisational) actions. It is also about identifying and strengthening complementarities and tradeoffs with various other policy objectives of government (e.g. poverty alleviation, sustainable development) in an attempt to promote actions to tackle climate change.

In Sierra Leone, this will require a redesign of the planning process in both its material and its procedural aspects. A number of other specific actions have already been discussed in Chapter Eight (Section B). Such actions are critical given the complexities that currently characterise the country's planning process. These relate to the outmoded nature of the existing planning policies and regulations, and the weak administrative machinery, which makes planning very reactive, and restrictive. As pointed out in that Section (Section B of Chapter Eight), the planning process needs to be reformed not only to make it more proactive and enforceable, but to also make it more enabling for climate change responses. This will involve reviewing and updating the various regulations, plans, codes and

procedures, as well as relaxing some of the rules to make them match up with both the current and future challenges which climate change will present. In this regard, the plans and policies should be designed to fully reflect the socioeconomic divide in the country, since its widespread poverty, inequality and lack of access to resources have been a major factor underlying the growth of informal settlements. In Freetown, the growth of informal settlements is related to the spread of vulnerability, since most of these settlements have developed in unsafe areas where climate change impacts are predicted to be high. One way that planning can reduce vulnerability in Freetown is by lowering standards for land use in ways that enable the poor to gain access to land (Magigi and Majani, 2005). It will also involve the use of policy-measures which work to increase the availability and accessibility of land, based on efficiency and equity considerations. Other approaches include the imposition of restrictions on the development of land in newly-created areas that are hazard prone; upgrading vulnerable settlements that are already occupied; or where upgrading is not possible, relocating occupants to 'agreeable' locations with 'suitable' compensation packages. Of particular importance is the need to protect the city's ecological services, including its environmentally sensitive areas (Bernstein, 1992: 157-158).

Another issue of importance is the need to put in place clear and appropriate strategies for addressing climate change concerns in Freetown that involve working with residents of the various settlements where vulnerability is high. Drawing from best practice in other parts of the world, planners can provide guidance to local residents about the most suitable forms of dwellings for withstanding the hazards of a changing climate. This will, however, require a constant process of good quality research into the likely patterns of the future climate and its potential impacts. A clear, robust, and more effective means of communicating this information to end-users will need to be devised. This work acknowledges however that making these kinds of technocratic recommendations does not always translate into action, since aspects such as attitude and behaviour are very difficult to predict and resolve. There is therefore a need to continuously engage with the public through awareness raising, community participation and capacity building, among other means.

## 9.5 Reflections on the Research Experience

Prior to undertaking this research, I worked as a lecturer (Njala University) in one of Sierra Leone's two universities. I did not therefore have any prior experience of working in planning practice. However, the experience I gained through supervising a number of undergraduate research studies on important planning issues in Sierra Leone has proved useful in many aspects of this work. One such aspect was the understanding gained that in contexts where planning systems are weak, unexpected increases in urban populations can intensify pressures for land, with severe implications for the spatial development of cities, as well as the conditions in which people live. Thus, I was already aware of how inadequacies in the planning and development processes can produce appalling conditions in cities. But because at the beginning of this research my knowledge about climate change issues was limited (despite having studied geography for my Bachelor's Degree), I did not feel very confident about this inquiry. The first two months were thus the most terrifying stage of my research life, when for the very first time, I was faced with the task of carrying out independent research at a higher level of rigour. Yet, as discussed in Section 1.2, the fulfilment I derived from the quest to provide answers to the growing problem of climate-related disasters in particular areas of Freetown slowly began to restore my confidence.

Within just a few weeks of scrupulous reading around my research topic, it dawned on me that insufficient background knowledge on climate change was not a good enough reason to be dissuaded from the study, since a number of the leading scholars on the subject approach it from different disciplinary backgrounds. Thus, I convinced myself that having access to the requisite materials (reading resources) and taking advantage of them was all that mattered. With this new approach, I gradually acclimatised to the onerous task of immersing myself into the theoretical foundations of the research. Amongst many others, the work of Piers Blaikie *et al.* (1994) was, at this stage, very enlightening as it made clear that the risks entailed in disasters are context-embedded and that it is only when hazard risks and the disasters that they cause are investigated within their social, economic and political context, that improvements can take place, and more practical solutions be achieved. With this understanding, it became clear to me that I understood a bit more about climate change disaster-related issues than I had earlier assumed. This assurance led me to challenge many of my conventional conceptions about disasters, specifically the view that disasters are natural. This also led me to rethink the role of planning in view of the widespread vulnerability in Freetown. It has, furthermore, allowed me to question much of

what other scholars and practitioners in climate change science think about the kind of strategies and measures that are appropriate for tackling climate change impacts.

My understanding of what I have analysed from the data has made me more critical about the kinds of attitude people demonstrate towards climatic events and what underlies the kinds of approaches that professionals adopt in addressing their impacts. I am now more aware of the assumptions that inform the choices which people and professionals make in the face of disaster and the reason why systems with similar physical and socio-economic attributes are differently affected by hazard events. I also feel more confident now to challenge different points of view, identify inherent weaknesses, and offer constructive suggestions. This ability to think and constructively engage with issues is perhaps the greatest change that has happened to me in the course of this learning process. It is no doubt a self actualising experience. This reflection aside, it is my hope that I have walked this journey honestly and conscientiously and that the inevitable bias that each researcher more or less inadvertently brings to their studies has not overly affected the validity of the findings and conclusions I have reached.

## **9.6 Reflections on theory**

This work has drawn from two streams of literature to discuss the different theoretical perspectives used in this study: first, the literature on climate change as it relate to cities (see Chapter 2) and secondly, the urban planning literature (see Chapter 3). Most of this research has tended to assume that planners already have knowledge about climate change and that the planning institutions and the agencies that address climate change have the capacity required to take effective action. Sections 3.7.2 and 3.8 have shown the sort of assertions made by scholars about the role which planners are required to play in reducing the potential harm that climate change will present to cities. The main area that this study has aimed to contribute to is the role that the local context and institutional conditions play in shaping climate change effects, including the ability of planners and other actors (locally and nationally) to address their impacts. For this reason, institutional theory and the collaborative planning approach have been used to bring out relevant ideas and concepts in the discussion of climate change-response planning.

Using institutional theory, this thesis has argued that vulnerability to climate change and the effects of GHG emissions have been influenced by a number of institutional and cultural factors. Vulnerability in Freetown has intensified because of the chaotic ways in which some settlements have developed, largely owing to the lack of access and entitlements to land among the poor, through the land and property market. This has been exacerbated by the differential provision of urban services and infrastructure in the city as exemplified by the differing living conditions of places. Institutions determine vulnerability, since they determine the extent to which people have access to resources and the type of development that occurs (Kelly and Adger, 2000). With regard to the latter, Van Den Broeck (2008) has argued that because planning takes place within an institutional context (planning laws, policies, procedures), it is this same context that determines whether or not, and where development interventions should be carried out. This view has been largely confirmed by this study, since planning activities and hence developments in Freetown, have usually focused on formal settlements. As a result of the societal constraints faced in the form of poverty, inequality, and lack of access to resources, it has also been difficult for many households to take positive action. These same processes, including the limited information on GHG emission levels and the low human and technical capacity for mitigation, have constrained actions to reduce GHG emissions in Freetown.

Alternatively, the collaborative planning approach has been used to argue that owing to the unequal power relations between the different classes of people within society, people who are most affected by the current changes in climate and whose interests adaptation decisions can better serve are usually left out of the decision making process. The lack of access by this section of the city's population including various other non-state actors (the FCC, CBOs, NGOs, and private businesses) confirms some of the leading criticisms about participatory processes. Moreover, the sectoral leanings that characterise the decision-making processes related to planning and the environment imply that not all countries (and their cities) have the relevant structures for the kind of intersectoral decisions needed for integrating climate change issues in urban planning.

The evidence analysed in this thesis has thus suggested that there is a serious gap in existing understandings about the capacity and context in which planning decisions are made, in many cities of the less-developed countries, where planners are required to integrate climate change concerns into their planning processes. These gaps centre around

the contextual and institutional forces which not only drive and condition climate change impacts in cities but also determine whether, how, and when planners and other actors (including households) take action to reduce potential harms. It is therefore argued that any attempt to promote a new discourse that accentuates the role of planning in dealing with climate change must seek to address these contextual and institutional differences.

## 9.7 Areas for Further Research

This thesis has presented and analysed a number of important issues relating to a broad field of study. It has not, however, been possible to address all aspects of research concerning climate change-integrated planning, since that body of knowledge is by itself inexhaustible. The following areas have therefore been identified as requiring further research, both to improve understandings about certain practical issues around planning and climate change, and to provide additional data to support planning and policy decisions. The first three are specific to Freetown while the fourth is proposed for a broader scale.

- More detailed research on climate change can be carried out at the urban scale, giving more attention to the wider regional context and the rural hinterland of the city. Exploring planning processes on this wider scale would be useful for providing information about how physical (relief) and environmental (river catchment areas) issues interact with human issues (migration) at this scale. Such information can be integrated into planning and policy decisions at different scales.
- A further study could be carried out that uses place-specific (downscaled) climate data to assess and analyse the future vulnerability of settlements based on a range of scenarios. This could be relevant for policy making because it provides more detailed and reliable information from which to identify the different pathways for dealing with potential climate change impacts.
- Regarding the issue raised by some interviewees about observed temperature increases, a study can be carried out to assess the rate of change in weather conditions for the country, based on the reports of a number of weather stations where data on previous weather conditions are available. This could provide a better understanding about the changing patterns in the country's climate and could also be used as a basis for planning decisions about development.

- In view of the present problems around adaptive capacity in many cities, there is need to undertake an in-depth study of the potential role of a city-wide strategy that focuses on the different aspects of the 'urban', consisting of the ecological, economic and social dimensions. Where specific attention is placed on understanding the value of an organised approach to the city by a range of actors, perhaps to promote sustainable urban landforms, this could provide the basis for making collective decisions about the city. The findings could also be useful both in urban and sectoral policies and practice.

## 9.8 Summary and Conclusion

By questioning the assumption that planning organisations already have the required capacity and know-how to address climate change, this work has thrown light on asymmetries in the planning conditions of a city in a less-developed country-city (Freetown) and other cities of the globe. The work has specifically emphasised that planning has a key role to play in limiting the effects of climate change on cities. Its effectiveness, however, depends on the quality of the existing policies and laws, the nature of the administrative machinery, the decision making processes and the level of capacity for planning. Based on this reality, it would be practical to conclude by acknowledging that the search for more effective and efficient ways to steer planning to tackle climate change has come a long way. Increasingly, lessons about good practice from a number of locations and cases are being reported. These can be either domesticated into local activities and programmes, or developed into policies at a range of scales.

However, for there to be continued progress in exploring more effective responses, it is important to keep in mind the influences that the institutional environment imposes on the behaviour of individuals and organisations, rather than only focusing on the task environment. As has been stated earlier, making climate change an integral part of urban planning decisions and processes is an important step in tackling climate change impacts on cities. Yet, because decisions about the various response activities will have to be made and carried out within institutions, it is important that the inherent characteristics which make up the context are enabling. This relates both to the task environment which addresses what actions need to be undertaken, and the institutional environment (the regulatory structures and the values, beliefs and norms) which influence the way individuals and organisations behave. It is about restructuring institutions in ways that

allow individuals and societies to reduce GHG emissions and also, tackle their impacts. It is also about building capacity for both planning and climate change actions, since much of the climate change literature already assumes that planning systems have the capacity required to deal with the various challenges of cities. In poor cities, capacity building is important because planners need to be knowledgeable about the implications climate change will present to urban planning interventions in cities. They need this knowledge to be able to make informed decisions on where and how new developments should occur and the type of sustainable solutions needed.

Capacity is also required to assess people's current vulnerability and needs and to envision what climate change impacts will be faced in the future. This should include an identification of the main factors that give rise to the vulnerability of places, as well as the opportunities and complementarities offered by the options for dealing with them. Such processes should be based on the democratic involvement of all categories of people who are most likely to be affected by the impacts. This involves building partnerships with civil society organisations and the private sector, including such bodies as NGOs. It implies that plan making has to be decentralised to the local level, where vulnerability to climate change is already high. It is important that the plans and policies are designed to reflect the local distinctiveness of places in terms of the climate change challenges that will be faced. This is because of the differentiated impacts that climate change will have given the different vulnerabilities faced by individuals and society (Smith et al., 2009; Simon and Fragkias, 2008: 11). Linkages between plans and strategies at the local level, and those at the national level, are also critical since they allow knowledge and skills to be exchanged between the two levels. By building synergy between climate change policies and other important policies and strategies of government, significant tradeoffs can be identified, with new opportunities to advance actions on mitigation and adaptation. This will be particularly relevant to cities, such as Freetown, in most less-developed countries, where there still exist no clear national strategy or regulation for responding to climate change.

## Appendix A: List of Interviews

### Interview with Representatives of Formal Institutions

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#### Officials from Local Government and CBO's

Code	Participant	Occupation	Date	Time	
				<i>From</i>	<i>To</i>
FT- OLG1	(M) 30-40	Development Planning officer	19.10.09	08:15	09:05
FT- OLG2	(M) 40-50	Development Planning officer	20.10.09	09:17	10:10
FT- OLG3	(M) 30-40	Environmental Affairs officer	16.11.09	11:45	12:50
FT- CBO1	(M) 40-50	Community Development officer	27.10.09	16:30	15:45
FT- CBO2	(F) 20-30	Community Affairs officer	24.11.09	16:00	15:15
FT- CBO3	(M) 30-40	Women's Leader	16.10.09	16:05	15:07
FT- CBO4	(M) 30-40	Community Project officer	03.12.09	17:15	18:10

## Officials from Central Government

Code	Participant	Occupation	Date	Time	
				From	To
CG-NCP1	(M) 50-60	Divisional Head of Tourism	07.12.09	15:17	16:10
CG-NCP2	(F) 30-40	Head of Disaster Management	02.12.09	11:10	12:15
CG-NCP3	(F) 50-60	Road Management Engineer	19.10.09	16:10	16:55
CG-NCP4	(M) 60-70	Adviser on Road Traffic Management	30.11.09	11:00	12:14
CG-NCP5	(M) 50-60	Water Engineer	28.10.09	13:10	14:00
CG-NCP6	(M) 60-70	Director of Development and Planning	04.10.09	10:15	11:00
CG-NCP7	(M) 40-50	Manager of Water Company	20.10.09	12:30	13:17
CG-NCP8	(M) 50-60	Donor Liaison Officer	27.11.09	10:10	11:00
CG-DPC1	(M) 40-50	New Head of Forestry	29.10.09	13:15	14:00
CG-DPC2	(M) 50-60	Acting Head of Housing	28.11.09	08:05	08:55

## Planning officials and Professionals from the Built Environment

Code	Participant	Occupation	Date	Time	
				From	To
EP-PMS1	(M) 50-60	Acting Head of SLEPA	12.10.09	08:30	09:00
EP-PMS2	(M) 50-60	Acting Head of Planning	04.11.09	10:45	11:45
EP-PMS3	(M) 50-60	Lands and Surveys Manager	23.10.09	13:04	14:10
EP-PBE1	(F) 30-40	Practicing Engineer	21.11.09	17:30	18:20
EP-PBE2	(M) 50-60	Practicing Architect	14.11.09	12:10	13:05

## Academics and Climate Change Practitioners

Code	Participant	Occupation	Date	Time	
				From	To
CA-CCP1	(M) 50-60	Head Climate Change Country Officer	10.11.09	10:30	11:35
CA-CCP2	(M) 50-60	Acting Head Meteorological office	22.10.09	10:05	11:00
CA-ACA1	(M) 50-60	Lecturer, Marine Sciences	12.11.09	09:15	10:05
CA-ACA2	(M) 50-60	Lecturer, Environmental Sciences	03.11.09	11:00	11:55

## NGO Workers and Officials from Bilateral and International Organisations

Code	Participant	Occupation	Date	Time	
				From	To
SL-NGO1	(M) 30-40	Disaster Management officer	23.10.09	09:07	10:00
SL-NGO2	(M) 30-40	Development officer	30.10.09	08:30	09:30
SL-NGO3	(M) 40-50	Project Coordinator	02.11.09	13:12	14:00
SL-NGO4	(M) 40-50	Environment officer	09. 11.09	10:00	10:55
SL-DON1	(F) 30-40	Climate Change Liaison officer	26. 10. 09	09:30	10:20
SL-DON2	(M) 40-50	Infrastructure Programmes officer	05. 11. 09	14:55	16:00

## Appendix B: Focus Group Interviews with Informal Institutions

### Community-Based Groups: Aberdeen

Code	Participant	Date	Time	
			From	To
FG1-ABD	(M) 30-40	20.10.09	16:30	18:00
	(M) 30-40			
	(M) 20-30			
	(F) 20-30			
	(M) 40-50			

**Community-Based Groups: Kingtom**

Code	Participant	Date	Time	
			<i>From</i>	<i>To</i>
FG2-KTM	(M) 30-40	21.10.09	16:00	17:45
	(M) 30-40			
	(M) 20-30			
	(M) 30-40			
	(M) 20-30			

**Community-Based Groups: Kroo Bay**

Code	Participant	Date	Time	
			<i>From</i>	<i>To</i>
FG3-KRB	(M) 30-40	22.10.09	16:00	17:30
	(F) 20-30			
	(F) 20-30			
	(M) 30-40			
	(M) 30-40			
	(M) 60-70			

**Community-Based Groups: East Brook**

Code	Participant	Date	Time	
			<i>From</i>	<i>To</i>
FG4-EBK	(M) 30-40	23.10.09	17:00	18:50
	(F) 20-30			
	(M) 30-40			
	(M) 20-30			
	(M) 40-50			

### Combined Focus Group Session

Code	Participant	Date	Time	
			<i>From</i>	<i>To</i>
<b>FG1-ABD</b>	(M) 30-40	08.12.09	13:00	15:00
	(M) 30-40			
	(F) 20-30			
	(M) 40-50			
<b>FG2-KTM</b>	(M) 30-40			
	(M) 30-40			
	(M) 20-30			
	(M) 20-30			
<b>FG3-KRB</b>	(M) 30-40			
	(F) 20-30			
	(M) 30-40			
	(M) 30-40			
	(M) 20-30			
<b>FG4-EBK</b>	(M) 30-40			
	(F) 20-30			
	(M) 30-40			
	(M) 20-30			
	(M) 40-50			

## **Appendix C: Themes of Interviews and Focus Groups**

- **Themes of Interviews with Planning Officials and Professionals from the Built environment**

*1. Roles and responsibilities*

*2. Planning decisions and practices relating to Freetown*

*3. Planning regulations and the governance process*

*4. Urban policy towards the current and future development of Freetown*

*5. Urban planning and the relations with climate change concerns for Freetown*

*6. Personal interests in climate change issues*

*7. Urban planning and the relations with other urban sector stakeholders*

*8. Capacity challenges for urban planning and climate change*

- **Themes of Interviews with Central and Local Government Officials**

*1. Roles and responsibilities*

*2. The role of the organisation in the planning and development of Freetown*

*3. Plans for the future development of Freetown*

*4. Recent trends in hazard and disaster risks in Freetown*

*5. The role of the organisation in addressing climate change*

*6. Relation with other urban sector stakeholders in the development of Freetown*

*7. Capacity challenges*

- **Themes of Interviews with Academics and Climate Change Practitioners**

1. *Roles and responsibilities*

2. *Recent trends in hazard and disaster risks in Freetown*

3. *The approach used to promote climate change*

4. *The structural and governance arrangements for climate change*

5. *Personal interest in climate change issues*

6. *Personal thoughts about the challenges and the way forward*

- **Themes of Interviews with CBO's, NGO's and Bilateral and International Organisations**

1. *The role of the institution in planning /climate change issues in Freetown*

2. *Recent trends in hazard and disaster risks*

3. *Personal interests in climate change/planning issues*

4. *Personal thoughts about the challenges and the way forward*

## Appendix D: Household survey

### SECTION A: Neighborhood Perception about Climate Change and Variability

#### A1. Occurrence of Climatic hazard

VARIABLES	RESPONSE OPTIONS	CODE
A1.1. Have you experienced any of the following incidents ( <i>hazards</i> ) in your neighborhood in the last two years? ( <i>please state the number of times you have experienced each event</i> )		
1. Flooding	01= No 02= Once 03= Twice 04= Other (specify).....	<input type="checkbox"/>
2. Landslide		<input type="checkbox"/>
3. Heavy rainfall		<input type="checkbox"/>
4. High temperatures		<input type="checkbox"/>
5. Other (Specify).....		<input type="checkbox"/>
A1.2. When did the incident ( <i>hazard</i> ) you experienced last happen in this settlement?		
1. Flooding	01= Last one week	<input type="checkbox"/>
2. Landslide	02= Last one month	<input type="checkbox"/>
3. Heavy rainfall	03= Last three months	<input type="checkbox"/>
4. High temperatures	04= Last six months	<input type="checkbox"/>
5. Other (Specify).....	05= Last one year	<input type="checkbox"/>
6. Other (Specify).....	06= Other (specify).....	<input type="checkbox"/>
A1.3. How often does the incident you experienced happen?		
1. Flooding	01=Monthly	<input type="checkbox"/>
2. Landslide	02= Several times a year	<input type="checkbox"/>
3. Heavy rainfall	03= Annually	<input type="checkbox"/>
4. High temperatures	04= Biennially	<input type="checkbox"/>
5. Other (Specify).....	05= ..... (specify any other time)	<input type="checkbox"/>
6. Other (Specify).....	06= ..... (specify any other time)	<input type="checkbox"/>
A1.4. Which time of the day did you experience the most recent event? (completed hour)		
		<input type="checkbox"/>

A1.5. In which month of the year did it occur?	<input type="checkbox"/>
--	--------------------------

**A2 Concern about the Climatic hazard**

VARIABLES	RESPONSE OPTIONS	CODE
A2.1. Please rank each event (hazard) you have experienced based on how concerned you are about it now		
1. Flooding	<i>99= No concern</i> <i>01= First most concern</i> <i>02= Second most concern</i> <i>03= Third most concern</i> <i>(and so on)</i>	<input type="checkbox"/>
2. Landslide		<input type="checkbox"/>
3. Heavy rainfall		<input type="checkbox"/>
4. High temperatures		<input type="checkbox"/>
5. Other (Specify).....		<input type="checkbox"/>

STATEMENT	RESPONSE OPTIONS	CODE
A2.2. How will you rank the following statements in terms of how they represent your concern about the event (hazard)? <i>(please rank your first three priorities only)</i>		
1. My house gets flooded	<i>01= First most priority</i> <i>02= Second most priority</i> <i>03= Third most priority</i>	<input type="checkbox"/>
2. My neighborhood gets flooded		<input type="checkbox"/>
3. My house gets damaged		<input type="checkbox"/>
4. My house properties may get damaged		<input type="checkbox"/>
5. It may cause the loss of life of my relatives or neighbours		<input type="checkbox"/>
6. My household member may be hurt		<input type="checkbox"/>
7. I fear it may affect my neighbours since my own house is safe		<input type="checkbox"/>
8. I fear it may affect other communities since my own house is safe		<input type="checkbox"/>

CLIMATIC HAZARD	EXPLANATION	CODE
A2.3. If you are concerned about possible changes in the event's (hazard's) future occurrence, please explain ? <i>1= Not concerned (skip) , 2= Concerned (explain below)</i>		<input type="checkbox"/>
1. Specify hazard: .....		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
2. Specify hazard: .....		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
3. Specify hazard: .....		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

### A3. Risk to climatic hazard

QUESTION/STATEMENT	RESPONSE OPTIONS	CODE
A3.1. How will you describe the status of this land you are living on?	01= I am the owner	<input type="checkbox"/>
	02= I am just a tenant	<input type="checkbox"/>
	03= I have no entitlement to it	<input type="checkbox"/>
A3.2. Who made the decision to build this house?	01= Myself	<input type="checkbox"/>
	02= Parents	<input type="checkbox"/>
	03= Relatives	<input type="checkbox"/>
	04= Friend	<input type="checkbox"/>
	05= I am only a rental and so, I don't know	<input type="checkbox"/>
	06= Other	<input type="checkbox"/>
A3.3. Which of the following statements best describe your reason for living in this settlement ( <i>please rank in order of your first three preferences only</i> )		
1. It is located in the city centre	<i>01= First most priority</i> <i>02= Second most priority</i> <i>03= Third most priority</i>	<input type="checkbox"/>
2. It is located close to my place of work		<input type="checkbox"/>
3. I cannot afford the cost of accommodation elsewhere		<input type="checkbox"/>
4. This is where i have lived since my childhood days		<input type="checkbox"/>
5. Rent is cheap here		<input type="checkbox"/>
6. Other ( <i>specify</i> )		<input type="checkbox"/>

VARIABLES	RESPONSE OPTIONS	CODE
A3.4. How satisfied are you with the following		
1. Living in this settlement	01= Very dissatisfied 02= Dissatisfied 03= Neutral 04= Satisfied 05=Very satisfied 99= Don't know	<input type="checkbox"/>
2. Location of this (your) house		<input type="checkbox"/>
3. Your housing condition		<input type="checkbox"/>
4. Sanitation system		<input type="checkbox"/>
5. Water supply		<input type="checkbox"/>
6. Drainage system		<input type="checkbox"/>
A3.5. If you experienced any problem with Municipal authorities or other government officials in building here, what was it about?		
1. Rules which forbid building in this area	01= Experienced problem 02= No problem experienced	<input type="checkbox"/>
2. Paying a fine concerning planning rules		<input type="checkbox"/>
3. Building permission		<input type="checkbox"/>
4. Other (please specify)		<input type="checkbox"/>
A3.6. Have you experienced any of the following due to the event (hazard) in the last two years?		
1. Lost relative	01= Yes 02= No	<input type="checkbox"/>
2. House damaged		<input type="checkbox"/>
3. Lost assets		<input type="checkbox"/>
4. Household member got injured		<input type="checkbox"/>
5. Other (please specify)		<input type="checkbox"/>

ASSETS MISSED MOST	EXPLANATION	CODE
<b>A3.7. Specify the lost assets you missed most and explain why? <i>List only five and rank in order of preference, with the one missed most at the top</i></b>		
1.		<input type="text"/> <input type="text"/> <input type="text"/>
2.		<input type="text"/> <input type="text"/> <input type="text"/>
3.		<input type="text"/> <input type="text"/> <input type="text"/>
4.		<input type="text"/> <input type="text"/> <input type="text"/>
5.		<input type="text"/> <input type="text"/> <input type="text"/>
ASSETS MISSED MOST	EXPLANATION	CODE
<b>A3. 8. Which of the assets lost in C7 above you have been able to recover and explain how you did it?</b>		
1.		<input type="text"/> <input type="text"/> <input type="text"/>
2.		<input type="text"/> <input type="text"/> <input type="text"/>
3.		<input type="text"/> <input type="text"/> <input type="text"/>
4.		<input type="text"/> <input type="text"/> <input type="text"/>
5.		<input type="text"/> <input type="text"/> <input type="text"/>

FACTORS	RESPONSE OPTIONS	CODE
A3.9. To what extent do you agree that the following factors have an influence on the level of risk faced by your house?		
1. This house is not strongly built	<i>01= Strongly disagree</i> <i>02= Disagree</i> <i>03= Neutral</i> <i>04= Agree</i> <i>05= Strongly agree</i> <i>99= Don't know</i>	<input type="checkbox"/>
2. This house is located on steep slope		<input type="checkbox"/>
3. This house is located in poorly drained area		<input type="checkbox"/>
4. This house is located in flood plain		<input type="checkbox"/>
A3.10. To what extent do you agree that the following factors have an influence on the level of risk experienced by your community?		
1. Poor drainage & infrastructure	<i>01= Strongly disagree</i> <i>02= Disagree</i> <i>03= Neutral</i> <i>04= Agree</i> <i>05= Strongly agree</i> <i>99= Don't know</i>	<input type="checkbox"/>
2. Location in low-lying coast		<input type="checkbox"/>
3. Location in flood plain		<input type="checkbox"/>
4. Location in steep & sloping area		<input type="checkbox"/>
5. Area lack protective cover		<input type="checkbox"/>

QUESTION	RESPONSE OPTIONS	CODE
A3.11. Do you (your household) have any other house in Freetown to live in apart from this?	<i>01= Yes</i> <i>02= No</i>	<input type="checkbox"/>
C12. If yes in C11 above, please specify where it is		<input type="checkbox"/>

#### A4 Knowledge of hazard and the relationship to climate change

QUESTION	RESPONSE OPTIONS	CODE
A4.1. How much can you remember about the last disaster incident?		<input type="checkbox"/>
A4.2. What about the one before that?		<input type="checkbox"/>
A4.3. Are you aware that the climate is changing?	01= No 02= Yes	<input type="checkbox"/>
A4.4. If you select yes in D3 above, please specify what you know about it.		<input type="checkbox"/>
A4.5. To what extent do you agree that the changing pattern of climate has an influence on the current problems faced?		
1. Climate change has an influence	01= Strongly disagree	<input type="checkbox"/>
	02= Disagree	<input type="checkbox"/>
	03= Neutral	<input type="checkbox"/>
2. Climate change has no influence	04= Agree	<input type="checkbox"/>
	05= Strongly agree	<input type="checkbox"/>
	99= Don't know	<input type="checkbox"/>
A4.6. What specific lessons have you learnt from past events that help you deal better with current and future events?		<input type="checkbox"/>
		<input type="checkbox"/>

STATEMENT	RESPONSE OPTIONS	CODE
A4.7. Which of the following statements agrees with what you think about the incident in the last five years?		
1. I observe that it has occurred less frequently and with less intensity	01= Agree 02= Don't agree	<input type="checkbox"/>

2. I don't observe any difference in its frequency and intensity	03= <i>Don't know</i>	<input type="checkbox"/>
3. I observe that it has occurred more frequently and with more intensity		<input type="checkbox"/>

### SECTION B: Coping Measures

QUESTION	RESPONSE OPTIONS	CODE
B1. Is this your normal place of residence?	01= <i>Yes (answer B2)</i> 02= <i>No (skip B2)</i>	<input type="checkbox"/>
B2. How long have you lived in this house?	<i>consider the completed years</i>	<input type="checkbox"/>
B3. How many people live with you in this household? ( <b>Count the household members</b> )	<i>Number of male &gt; 18 years</i> .....	<input type="checkbox"/>
	<i>Number of female &gt; 18 years</i> .....	<input type="checkbox"/>
	<i>Number of male &lt; 18 years</i> .....	<input type="checkbox"/>
	<i>Number of female &lt; 18 years</i> .....	<input type="checkbox"/>
B4. How many <b>dwelling rooms</b> does your household occupy?	<i>Total count:</i> .....	<input type="checkbox"/>
B5. How many other households live in this house/on this plot?		<input type="checkbox"/>
B6. How many people in all live in this house?	<i>Total number:</i> .....	<input type="checkbox"/>
B7. Have you done any of the following actions before in responding to the problems (climatic hazard) faced? ( <b>please rank three primary actions done</b> )		
1. Vacate the house	01= <i>First most primary action</i> 02= <i>Second most primary action</i> 03= <i>Third most primary action</i> 99= <i>No action done</i>	<input type="checkbox"/>
2. Vacate the neighbourhood		<input type="checkbox"/>
3. Relocate assets to safer places		<input type="checkbox"/>
4. Control flow of water into the house		<input type="checkbox"/>

5. Strengthen roof		<input type="checkbox"/>
6. Reinforce walls and pillars		<input type="checkbox"/>
7. Climb up on beds and roof tops		<input type="checkbox"/>
8. Other ( <i>Specify</i> ):		<input type="checkbox"/>
9. Other ( <i>specify</i> ):		<input type="checkbox"/>
10. Other ( <i>specify</i> ):		<input type="checkbox"/>
B8. How did you learn about the actions taken/done in E6 above?	<i>01= Radio</i> <i>02= Training workshops</i> <i>03= Other (specify).....</i> <i>04= Other (specify).....</i>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
QUESTION	RESPONSE OPTIONS	CODE
B9. To what extent do you agree that the following factors have an influence on your ability to deal with the problem?		
	<i>01= Strongly disagree</i>	<input type="checkbox"/>
1. Early warning systems	<i>02= Disagree</i>	<input type="checkbox"/>
2. Access to credit/loan facilities	<i>03= Neutral</i>	<input type="checkbox"/>
3. Provide training	<i>04= Agree</i>	<input type="checkbox"/>
4. Legal tenure to land	<i>05= Strongly agree</i> <i>99= Don't know</i>	<input type="checkbox"/>
B10. To what extent do you agree that the following measures will have an influencing role on the community's ability to minimise the problem		
1. Effective enforcement of building codes and regulations	<i>01= Strongly disagree</i>	<input type="checkbox"/>
2. Effective enforcement of zoning	<i>02= Disagree</i>	<input type="checkbox"/>
3. Improving on existing drainage	<i>03= Neutral</i>	<input type="checkbox"/>
4. Improving roads	<i>04= Agree</i> <i>05= Strongly agree</i> <i>99= Don't know</i>	<input type="checkbox"/>

5. Improving water supply		<input type="checkbox"/>
6. Improving on sanitation system		<input type="checkbox"/>
B11. Do you belong to any neighbourhood organization? ( <i>If yes, state three only</i> )	01= No	<input type="checkbox"/>
	02= Yes (Name): .....	<input type="checkbox"/>
	03= Yes (Name): .....	<input type="checkbox"/>
	04= Yes (Name): .....	<input type="checkbox"/>

NAME OF ORGANISATION	EXPLANATION	CODE
B12. For each organisation in B11 above, explain what it is about		
1. (Name): .....		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
2. (Name): .....		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
3. (Name): .....		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
NAME OF ORGANISATION	EXPLANATION	CODE
B13. How does each of the organisations in B11 above help to address community problems?		
1. (Name): .....		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
2. (Name): .....		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
3. (Name): .....		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
B14. For each organization in B11 above, explain why you take part / do not take part in		

its activities		
1. (Name): .....		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
2. (Name): .....		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
3. (Name): .....		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
B15. What other role do you think the neighbourhood organisation can play to reduce hazards?		
1.		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
2.		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
3.		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4.		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
5.		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

**SECTION C: Support from governments (local and national) and non-state actors**

QUESTION	RESPONSE OPTIONS	CODE
C1. Do you get assistance from any of the following bodies when you experience a hazard in your neighbourhood?	01= Freetown City Council (FCC)	<input type="checkbox"/>
	02= Office of Disaster Management (Office of National Security)	<input type="checkbox"/>
	03= GOSL ministries (Specify): ..... .....	<input type="checkbox"/>
	04= NGO (Specify): .....	<input type="checkbox"/>

	.....	
	05= <i>Other (specify):</i> .....	<input type="checkbox"/>
	06= <i>Other (specify):</i> .....	<input type="checkbox"/>
C2. If you received assistance, please specify the form in which it is provided	01= <i>Provision of food supplies</i>	<input type="checkbox"/>
	02= <i>Resettle in a temporary location</i>	<input type="checkbox"/>
	03= <i>Provision of credit/loan facilities</i>	<input type="checkbox"/>
	04= <i>Provision of construction tools and building materials</i>	<input type="checkbox"/>
	05= <i>Improvement of community (drainage, sanitation etc.)</i>	<input type="checkbox"/>
	06= <i>Other (specify):</i> .....	<input type="checkbox"/>
C3. How satisfied are you with regard to the following		
1. The type of support received	01= <i>Very dissatisfied</i> 02= <i>Dissatisfied</i> 03= <i>Neutral</i> 04= <i>Satisfied</i> 05= <i>Very satisfied</i> 99= <i>Don't know</i>	<input type="checkbox"/>
2. The timeliness of the support		<input type="checkbox"/>
3. Your involvement in decision making relating to the provision of the support		<input type="checkbox"/>
C4. How satisfied are you with the following sources of assistance?		
1. Local government support (FCC)	01= <i>Very dissatisfied</i> 02= <i>Dissatisfied</i> 03= <i>Neutral</i> 04= <i>Satisfied</i> 05= <i>Very satisfied</i>	<input type="checkbox"/>
2. Central government support		<input type="checkbox"/>
3. Support from office for		<input type="checkbox"/>
4. Disaster Management		<input type="checkbox"/>

5. Support from NGOs		<input type="checkbox"/>
6. Services by community groups		<input type="checkbox"/>

**SECTION D: Respondent's personal information**

VARIABLES	RESPONSE OPTIONS	CODE
D1. Sex	1= Male 2= Female	<input type="checkbox"/>
D2. Age	In Years: .....	<input type="checkbox"/>
D3. Marital status	01= Single                      02= Divorced 03= Married                    04= Widowed	<input type="checkbox"/>
D4. Nationality	01= Sierra Leonean    02= Nigerian 03= Ghanaian            04= Other (Specify) ..... .....	<input type="checkbox"/>
D5. Employment	01= Unemployed            02= Self employed 03= Public sector            05= Private sector	<input type="checkbox"/>
D6. Main livelihood activity	01= Fishing 02= Mangrove crop farming 03= Petty trading 04= Casual paid labour 05= Other (specify) .....	<input type="checkbox"/>
D7. Education	01= Uneducated 02= Can read and write 03= Completed Primary school 04= Completed Secondary School	<input type="checkbox"/>
D8. Relationship to house owner	01= House owner            02= Son/daughter 03= Spouse                    04= Sister/brother 05= Relative                   06= Tenant	<input type="checkbox"/>

	07= Other (specify) .....	
D9. Dwelling wall	01= Wood 02= Cement 03= Corrugated iron 04= Mud 05= Other (specify).....	<input type="checkbox"/>
D10. Dwelling roof	01= Thatch 02= Tarpaulin 03= Aluminum 04= Corrugated iron 05= Other (specify) .....	<input type="checkbox"/>
D11. Dwelling floor	01= Mud 02= Cement 03= Tile 04= Other (specify) .....	<input type="checkbox"/>

## Appendix E: The NVivo Software tool used to analyse the qualitative data

The screenshot displays the NVivo software interface. The top menu bar includes File, Home, Create, External Data, Analyze, Explore, Layout, and View. Below the menu is a ribbon with various tool icons for workspace, item, clipboard, format, paragraph, styles, and editing.

The main window is divided into several sections:

- Nodes:** A tree view on the left showing a hierarchy of nodes: Cases, Free Nodes, Tree Nodes, Relationships, and Matrices.
- Free Nodes:** A table listing various nodes with their respective source counts, reference counts, creation/modification dates, and authors.
- Field Data:** A section at the bottom showing the selected node 'Community vulnerabilities' with its coverage statistics and a detailed text excerpt.

Name	Sources	References	Created On	Created By	Modified On	Modified By
Capacity problems	3	6	22/09/2010 17:11	JMM	22/09/2010 18:49	JMM
Climate change project	2	14	22/09/2010 17:42	JMM	22/09/2010 18:49	JMM
Community vulnerabilities	1	3	22/09/2010 17:24	JMM	22/09/2010 17:40	JMM
complete lack of understanding	1	1	18/05/2010 10:55	JMM	02/06/2010 18:32	JMM
Considerations of climate	2	4	22/09/2010 17:10	JMM	22/09/2010 18:15	JMM
Disaster management issues	1	1	22/09/2010 17:40	JMM	22/09/2010 17:40	JMM
Environmental issues	2	5	22/09/2010 17:00	JMM	22/09/2010 17:32	JMM
Funding	1	1	22/09/2010 18:17	JMM	22/09/2010 18:17	JMM
Institutional set-up, roles & rel	2	13	22/09/2010 16:24	JMM	22/09/2010 18:17	JMM
Institutions working relations	2	7	22/09/2010 17:00	JMM	22/09/2010 18:15	JMM
Mitigation Issues	1	1	22/09/2010 17:03	JMM	22/09/2010 17:05	JMM
Mitigation techniques	1	3	22/09/2010 17:09	JMM	22/09/2010 17:16	JMM
Planning problems	1	3	17/05/2010 11:53	JMM	02/06/2010 18:32	JMM
Response actions	3	12	22/09/2010 17:14	JMM	22/09/2010 18:51	JMM
Responsibility for climate chan	2	2	22/09/2010 18:19	JMM	22/09/2010 18:49	JMM
Support for climate change	1	13	22/09/2010 18:28	JMM	22/09/2010 18:51	JMM
Support from government	1	2	22/09/2010 17:37	JMM	22/09/2010 18:13	JMM
Support to other institutions	1	1	22/09/2010 17:14	JMM	22/09/2010 17:14	JMM
Tackling capacity problems	2	2	22/09/2010 18:18	JMM	22/09/2010 18:44	JMM
The Climate Change Project	1	3	10/06/2010 17:10	JMM	10/06/2010 17:46	JMM

**Field Data** Community vulnerabilities

<Internals\Field Interviews\ISLEPAT> - § 3 references coded [22.31% Coverage]

Reference 1 - 7.03% Coverage

**Likely consequences of environmental degradation:** The consequence is a challenge to everyone and to every sector because during the rains, the rainwater drains/washes volumes of waste matter including loose and exposed soils on the roads and street ways. Even after the rains, most of the roads and streets remain nearly devastated with potholes and accumulations of silt and rubbish. Sanitation is also a major problem because most settlements are either not planned or are inadequately planned. Many houses are built without any toilet facility or are poorly ventilated. Some structures are even built such that they obstruct the flow of rainwater. Also, the soate of deforestation not onlv leads to heavv

## Appendix F: The SPSS Software tool used to analyse the quantitative data

\*Output4 [Document4] - SPSS Statistics Viewer

File Edit View Data Transform Insert Format Analyze Graphs Utilities Add-ons Window Help

Study Location \* Receive outside

			Yes	No	Total
Study Location 1	Count		4	46	50
	% within Study Location		8.0%	92.0%	100.0%
	% of Total		2.0%	23.0%	25.0%
2	Count		31	19	50
	% within Study Location		62.0%	38.0%	100.0%
	% of Total		15.5%	9.5%	25.0%
3	Count		50	0	50
	% within Study Location		100.0%	.0%	100.0%
	% of Total		25.0%	.0%	25.0%
4	Count		8	42	50
	% within Study Location		16.0%	84.0%	100.0%
	% of Total		4.0%	21.0%	25.0%
Total	Count		93	107	200
	% within Study Location		46.5%	53.5%	100.0%
	% of Total		46.5%	53.5%	100.0%

**Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	110.843 <sup>a</sup>	3	.000
Likelihood Ratio	138.028	3	.000
Linear-by-Linear Association	3.844	1	.050
N of Valid Cases	200		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.25.

**Study Location \* Experience erosion z**

**Crosstab**

			Experience erosion z		Total
			1.00	2.00	
Study Location 1	Count		0	50	50
	% within Study Location		.0%	100.0%	100.0%
	% of Total		.0%	25.0%	25.0%
2	Count		4	46	50
	% within Study Location		8.0%	92.0%	100.0%
	% of Total		2.0%	23.0%	25.0%

## Appendix G: Deriving the component and sub-component values in calculating the CVI

### (1) Calculating component and sub-component values for Exposure to hazard

Component	Variable	Aberdeen (n = 50)	Kingtom (n = 50)	Kroo Bay (n = 50)	East Brook (n = 50)
Exposure to hazard	Number of hazard-related deaths - 2007-08	0	2	4	3
	Areas with large presence of muddy puddles	0	7	50	49
	Houses with cracks and water marks on walls	0	11	36	38
	Area designated as unsafe for settlement	0	0	50	50
	Number injured by hazards in 2007-08	0	3	19	16
<b>Total</b>		0	23	159	156

Standardisation

$$X_{ij} = \frac{(Y_{ij} - \text{Min}_{yi})}{(\text{Max}_{yi} - \text{Min}_{yi})} \quad i = 1, 2, 3, 4; j = 1, 2, 3, \dots, 27$$

e.g. calculating for 'Number of hazard-related deaths in 2007-08':

(i) Aberdeen:  $\frac{0-0}{1-0} = 0$ ; Kingtom:  $\frac{0.5-0}{1-0} = 0.5$ ; Kroo Bay:  $\frac{1-0}{1-0} = 1$ ; East Brook:  $\frac{0.75-0}{1-0} = 0.75$

1 - 0

1 - 0

1 - 0

1 - 0

Component	Variable	Aberdeen	Kingtom	Kroo Bay	East Brook
Exposure to hazard	Number of hazard-related deaths - 2007-08	0	0.5	1	0.75
	Areas with large presence of muddy puddles	0	0.13	1	0.97
	Houses with cracks and water marks on walls	0	0.29	0.96	1
	Area designated as unsafe for settlement	0	0	1	1
	Number injured by hazards in 2007-08	0	0.16	1	0.84
<b>Component indicator values</b>		0	1.09	4.96	4.56

(2) Calculating component and sub-component values for Socio-demographic profile

Component	Variable	Aberdeen (n = 50)	Kingtom (n = 50)	Kroo Bay (n = 50)	East Brook (n = 50)
Socio- demographic profile	Number of households aged 60+	2	9	2	1
	Households aged 5+ not attending school	19	9	23	13
	Households aged 18+ engaged in primary production	22	32	42	27
	Households aged 18+ that is unemployed	20	15	8	13
	Households with single female heads	2	9	15	3
	Household heads without a spouse	13	28	39	38
<b>Total</b>		78	102	129	95

Standardisation

$$X_{ij} = \frac{(Y_{ij} - \text{Min}_i)}{(\text{Max}_i - \text{Min}_i)} \quad i = 1, 2, 3, 4; j = 1, 2, 3, \dots, 27$$

e.g. calculating for 'Number of households aged 60+':

(i) Aberdeen:  $\frac{2-1}{9-1} = 0.13$ ; Kingtom:  $\frac{9-1}{9-1} = 1$ ; Kroo Bay :  $\frac{2-1}{9-1} = 0.13$ ; East Brook:  $\frac{1-1}{9-1} = 0$

9 - 1

9 - 1

9 - 1

9 - 1

Component	Variable	Aberdeen	Kingtom	Kroo Bay	East Brook
Socio-demographic profile	Number of households aged 60+	0.13	1	0.13	0
	Households aged 5+ not attending school	0.71	0	1	0.29
	Households aged 18+ engaged in primary production	0	0.5	1	0.25
	Households aged 18+ that is unemployed	1	0.58	0	0.42
	Households with single female heads	0	0.54	1	0.08
	Household heads without a spouse	0	0.58	1	0.96
<b>Component indicator values</b>		1.84	3.2	4.13	2

### (3) Calculating component and sub-component values for Settlement sensitivity

Component	Variable	Aberdeen (n = 50)	Kingtom (n = 50)	Kroo Bay (n = 50)	East Brook (n = 50)
Adaptive Capacity	Participate in community decisions	6	24	44	5
	Take action to cope	34	47	50	45
	Belong to a CBO	39	46	44	35
	Aware of climate change	45	11	36	37
	Aware of disaster risk	49	45	44	41
	Have somewhere else to live	7	9	11	2
	Have had training on coping strategies	2	33	11	3
	Receive support when faced with hazards	4	31	50	8
	Have access to credit facilities	30	27	13	12
<b>Total</b>		<b>204</b>	<b>273</b>	<b>303</b>	<b>188</b>

Derive the inverse value

(that is,  $1/n$ ) where  $n$  is the variable value as shown in the table above

Component	Variable	Aberdeen	Kingtom	Kroo Bay	East Brook
Adaptive Capacity	Participate in community decisions	0.166	0.041	0.022	0.2
	Take action to cope	0.029	0.021	0.02	0.022
	Belong to a CBO	0.025	0.021	0.022	0.028
	Aware of climate change	0.022	0.090	0.027	0.027
	Aware of disaster risk	0.020	0.022	0.022	0.024
	Have somewhere else to live	0.142	0.111	0.090	0.5
	Have had training on coping strategies	0.5	0.030	0.090	0.333
	Receive support when faced with hazards	0.25	0.032	0.02	0.125
	Have access to credit facilities	0.033	0.037	0.076	0.083
<b>Total</b>		<b>1.187</b>	<b>0.405</b>	<b>0.389</b>	<b>1.342</b>

Standardisation

$$X_{ij} = \frac{(Y_{ij} - \text{Min}_i)}{(\text{Max}_i - \text{Min}_i)} \quad i = 1, 2, 3, 4; j = 1, 2, 3 \dots 27$$

e.g. calculating for 'Participate in community decisions':

(i) Aberdeen:  $\frac{0.166 - 0.022}{0.2 - 0.022} = 0.83$ ; Kingtom:  $\frac{0.041 - 0.022}{0.2 - 0.022} = 0.11$ ; Kroo Bay :  $\frac{0.022 - 0.022}{0.2 - 0.022} = 0$ ; East Brook:  $\frac{0.2 - 0.022}{0.2 - 0.022} = 1$

$$0.2 - 0.022$$

$$0.2 - 0.022$$

$$0.2 - 0.022$$

$$0.2 - 0.022$$

Component	Variable	Aberdeen	Kingtom	Kroo Bay	East Brook
Adaptive /coping capacity	Participate in community decisions	0.83	0.11	0	1
	Take action to cope	1	0.1	0	0.2
	Belong to a CBO	0.57	0	0.14	1
	Aware of climate change	0	1	0.09	0.07
	Aware of disaster risk	0	0.5	0.5	1
	Have somewhere else to live	0.13	0.05	0	1
	Have had training on coping strategies	1	0	0.13	0.65
	Receive support when faced with hazards	1	0.05	0	0.46
	Have access to credit facilities	0	0.08	0.86	1
<b>Component indicator values</b>		<b>4.53</b>	<b>1.89</b>	<b>1.72</b>	<b>6.38</b>

**(4) Calculating component and sub-component values for Settlement sensitivity**

Component	Variable	Aberdeen (n = 50)	Kingtom (n = 50)	Kroo Bay (n = 50)	East Brook (n = 50)
Settlement sensitivity	Dwellings with private water taps/ taps in the immediate neighbourhood	38	32	40	42
	Dwellings with self toilet facilities/ toilets in the immediate neighbourhood	38	28	11	8
	Settlement that is planned with good roads	50	50	2	2
	Dwellings roofed with zinc	49	45	48	43
	Dwellings with walls made of cement	32	41	5	16
	Average number of persons per room	2	3	7	6
	Respondents that lost assets to hazards in 2007-08	3	5	23	19
<b>Total</b>		<b>212</b>	<b>204</b>	<b>136</b>	<b>136</b>

Component	Variable	Aberdeen	Kingtom	Kroo Bay	East Brook
Settlement sensitivity	*Dwellings with private water taps/ taps in the immediate neighbourhood	0.026	0.031	0.025	0.023
	*Dwellings with self toilet facilities/ toilets in the immediate neighbourhood	0.026	0.035	0.09	0.125
	*Settlement that is planned with good roads	0.02	0.02	0.5	0.5
	*Dwellings roofed with zinc	0.020	0.022	0.021	0.023
	*Dwellings with walls made of cement	0.031	0.024	0.2	0.062
	Average number of persons per room	2	3	9	7
	Respondents that lost assets to hazards in 2007-08	3	17	11	23
<b>Total</b>		5.303	20.132	20.836	30.733

\*Variables with derived inverse values

Standardisation

$$X_{ij} = \frac{(Y_{ij} - \text{Min}_i)}{(\text{Max}_i - \text{Min}_i)} \quad i = 1, 2, 3, 4; j = 1, 2, 3 \dots 27$$

e.g. calculating for 'Dwellings with private water taps':

(i) Aberdeen:  $\frac{0.026 - 0.023}{0.031 - 0.023} = 0.38$ ; Kingtom:  $\frac{0.031 - 0.023}{0.031 - 0.023} = 1$ ; Kroo Bay :  $\frac{0.025 - 0.023}{0.031 - 0.023} = 0.25$ ; East Brook:  $\frac{0.023 - 0.023}{0.031 - 0.023} = 0$

0.031 - 0.023

0.031 - 0.023

0.031 - 0.023

0.031 - 0.023

<b>Component</b>	<b>Variable</b>	<b>Aberdeen</b>	<b>Kingtom</b>	<b>Kroo Bay</b>	<b>East Brook</b>
Settlement sensitivity	Dwellings with private water taps/ taps in the immediate neighbourhood	0.38	1	0.25	0
	Dwellings with self toilet facilities/ toilets in the immediate neighbourhood	0	0.09	0.65	1
	Settlement that is planned with good roads	0	0	1	1
	Dwellings roofed with zinc	0	0.67	0.33	1
	Dwellings with walls made of cement	0.04	0	1	0.22
	Average number of persons per room	0	0.14	1	0.71
	Respondents that lost assets to hazards in 2007-08	0	0.69	0.42	1
<b>Component indicator values</b>		0.42	2.59	4.65	4.93

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