Rising to the Adaptation Challenge? Responding to Global Environmental Change in eThekwini and Ugu Municipalities, South Africa

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Declaration of Authorship:

I Hayley Jane Leck hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly stated.

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Abstract

In response to rising concerns about adverse global environmental change (GEC), or climate change (CC) impacts, adaptation and mitigation measures are being widely implemented. However, much still needs to be understood about how these measures manifest in reality at various scales and the drivers and barriers to action in specific contexts. This thesis uses multiple social science research methods to investigate responses to GEC/CC, with a particular emphasis on adaptation and underlying development contexts, within the neighbouring Ugu and eThekwini local government districts in KwaZulu-Natal province, South Africa. The study's focus on local authorities and communities is pertinent given that many adaptation and some mitigation actions are ultimately undertaken at local scales. The thesis comprises two main layers of analysis: first, a comparative analysis of Ugu and eThekwini municipalities' GEC/CC responses and an investigation of the relationship between these municipalities regarding environmental and GEC agendas, and the likely effect of collaboration or lack thereof on GEC adaptation initiatives. Second, incorporating these municipal-scale findings, I explore understandings and responses to climate variability and change and their likely effects within several diverse local study sites across rural-urban continua within both municipalities. The results show that, despite their close proximity, the two municipalities have responded to GEC in very different ways and that municipal authorities, together with their respective diverse local populations, have divergent adaptive capacities. The research also reveals that horizontal inter-municipal collaboration and vertical collaboration between multiple government spheres is weak. The thesis suggests that strengthening such collaboration within a multi-level governance framework can facilitate effective adaptation and address current divergent municipal adaptive capacities. The thesis also reveals the importance for GEC measures to account for the diversity of understandings, responses and vulnerabilities to GEC amongst local populations, shaped by multiple climatic and non-climatic stresses, including cultural beliefs.

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List of Acronyms

ANC	African National Congress
AsgiSA	Accelerated and Shared Growth Initiative
ASSAF	Academy of Science of South Africa
CBOs	Community based organisations
CC	Climate change
CCS	Centre for Civil Society at the University of KwaZulu-Natal, South Africa
CDM	Clean Development Mechanism
CMP	Coastal Management Plan
COGTA	Department of Co-operative Governance and Traditional Affairs
COP	Conference of the Parties (under the UNFCCC)
CSIR	Council for Scientific and Industrial Research
DANIDA	Danish International Development Agency
DCCP	Durban Climate Change Partnership
DEA	Department of Environmental Affairs
DEARD	Department of Environmental Affairs and Rural Development (KZN Province)
DMA	Disaster Management Act (No. 57 of 2002)
D'MOSS	Durban Metropolitan Open Space System
DOE	Department of Energy
DPLG	Department of Provincial and Local Government
DRR	Disaster Risk Reduction
ECO	Environmental control officer
EDD	Economic Development Department
EIA	Environmental Impact Assessment
EM	Ecological modernisation
EMP	Environmental management plan
EPCPD	Environmental Planning and Climate Protection Branch
FDI	Foreign direct investment
FVC	Ghandinagar Flood Victims Committee
GCM	Global Circulation Model (GCM)
GDP	Gross Domestic Product
GEC	Global environmental change
GEAR	Growth, Employment and Redistribution Strategy
GEF	Global Environmental Facility
GHG	Greenhouse gas
GHGs	Greenhouse gases
HCCAS	Headline Climate Change Adaptation Strategy
HDR	Human development report
HSRC	Human Sciences Research Council
HIV/AIDS	Human immunodeficiency virus/acquired immunodeficiency syndrome
ICLEI	Local Governments for Sustainability
ICM	Integrated Coastal Management
ICMA	Integrated Coastal Management Act (24 of 2008)
IDPs	Integrated Development Plans
IEMP	Integrated Environmental Management Plan
IGCCC	Intergovernmental Committee on Climate Change
IHDP	International Human Dimensions Programme on Global Environmental Change
INC	Initial National Communication
IMCCC	Inter-Ministerial Committee on Climate Change

IPCC	Intergovernmental Panel on Climate Change
ITK	Indigenous Technical Knowledge
KwaNaloga	KwaZulu-Natal Local Government Association
KZN	Kwa-Zulu Natal
LAP	Local Area Plan
LDCF	Least Developed Countries Fund
LTMS	Long term mitigation/emissions scenarios
MCPP	Municipal Climate Protection Programme
MDG	Millennium Development Goals
MEC	Minerals Energy Complex
MNCs	Multi-national companies
MINMEC	Ministerial Political Forum
NCCC	National Climate Change Committee
NCCR	National Climate Change Response
NCCRS	National Climate Change Response Strategy
NEMA	National Environmental Management Act
NFSD	National Framework for Sustainable Development
NGOs	Non-governmental organisations
NGP	New Growth Path
NPC	National Planning Commission
PCAS	Policy Coordination and Advisory Services, South Africa
PLGA	Provincial Local Government Association
REFIT	Renewable energy feed-in tariff
RDP	Reconstruction and Development Programme
ROSCA	Rotating Savings and Credit Associations
SA	South Africa/n
SACN	South African Cities Network
SACSCC	SA Country Study on Climate Change
SADC	Southern African Development Community
SALGA	South African Local Government Association
SANBI	South African National Biodiversity Institution
SASAS	South African Social Attitudes Survey
SDCEA	South Durban Community Environmental Alliance
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SES	Socio-ecological systems
SCCF	Special Climate Change Fund
SMP	Shoreline Management Plan
SNC	Second National Communication
Stats SA	Statistics South Africa
UGEC	Urbanization and Global Environmental Change Project of IHDP
ULM	Umdoni Local Municipality
UN	United Nations
UNEP	UN Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
UK	United Kingdom
UKZN	University of KwaZulu Natal
V&A	Vulnerability & Adaptation
WESSA	Wildlife and Environment Society of South Africa
WDR	World Development Report

WMO	World Meterorological Organization
WPO	World Public Opinion Panel

Glossary

Nkanyamba	Mythical serpent
Nkosi	Traditional leader or chief
Amakosi	Plural for traditional leader
Mpundulu	Lightning bird
Nkosozane/Mami Wata	Half mermaid/half fish mythical supernatural power with the ability to cause high seas and rains
Nkanyamba	Mythical aquatic snake with powers to cause tornados and fly through the sky in dark clouds
Mielie	Maize or corn
Sangoma	Witchdoctor
Stokvel	Collective saving scheme
Shebeen	Informal liquor store or bar

Chapter 1: Introduction

1.1 Introduction

Anthropogenic climate change (CC) or, more broadly, global environmental change (GEC)[1] is one of the defining phenomena of the current era. While there are still uncertainties about its specific nature and likely manifestations, GEC/CC is widely recognised as a pervasive force that will (inevitably) affect interconnected socio-ecological systems (SES), from local to global scales and alter life on earth as we know it. Regardless of this recognition and human abilities to plan for and adapt, to varying degrees, to predicted GEC/CC effects, adaptation plans and actions have been delayed and complicated by, amongst other issues, political challenges, uncertainties about characteristics and impacts of future climate, as well as CC scepticism (often fuelled by mass media's questioning of scientific accuracy). Premised on the argument that adaptation with and to GEC/CC is necessary for humankind to survive rapidly changing environments, this thesis is about whether, to what extent, and how adaptation processes are manifest at the municipal- and household-scales in the neighbouring eThekwini[2] and Ugu municipalities/local government districts in KwaZulu-Natal (KZN) province, South Africa (SA), and understanding the barriers and enablers[3] to adaptation at these scales.

The recent flurry of research that points to widespread impacts and vulnerabilities has helped to place GEC/CC firmly on political agendas and encourage both mitigatory and adaptive action. However, in order to respond effectively to the challenges placed on human societies, much empirical research is still needed to understand place-specific and multi-scalar GEC/CC vulnerabilities and adaptive possibilities within diverse SES, and the underlying forces shaping differential vulnerabilities. This argument has theoretical, policy and practical salience. Therefore, this study identifies and responds to academic and policy needs through a multi- and cross-scale empirical investigation of

[1] These two terms are defined in Section 1.3. To facilitate discussion, they are used interchangeably in this thesis.
[2] eThekwini municipality (formerly Durban City Council) encompasses the city of Durban. I apply these names interchangeably in the thesis. Durban is the host city for the 17th Conference of the Parties negotiations (COP 17) to the UNFCCC (28/11/11 to 9/12/2011). An in-depth analysis of likely outcomes and implications of COP 17 is beyond the bounds of this thesis and thus only briefly referred to.
[3] I use the terms 'barrier' and 'constraint' interchangeably to describe any influence that constrains actions/responses. The words facilitators and opportunities are used interchangeably to describe issues that support actions/response.

understandings and responses to GEC/CC, with a particular emphasis on adaptation and underlying development contexts within the neighbouring local governments under investigation. As with sustainable development, GEC can be understood as an inherently multi-level issue and adaptation is therefore a multi-layered and continuous process (Brown, 2009; Pelling, 2011). While recognising scalar interdependency, my focus on local authorities and communities is particularly pertinent, given that many adaptation and some mitigation actions are ultimately undertaken at local scales (Satterthwaite et al, 2009; Pelling and Wisner, 2009).

The research comprises two main interconnected layers or scales of analysis. The first layer entails a comparative investigation of Ugu and eThekwini municipalities' GEC/CC responses and analysis of the relationship between the municipalities regarding environmental and CC agendas. As a key concern, the likely implications of horizontal and vertical collaboration, or lack thereof, between these municipalities and other government spheres on GEC adaptation initiatives are considered.

Incorporating findings from the first layer, the second layer explores popular/citizens' understandings of and responses to climate variability (and by extension GEC) within several study sites. These sites are sampled from across the rural-urban continuum and diverse socio-economic and cultural contexts within both municipalities. Although empirical analysis is confined to the KZN study contexts, which impart certain distinctive elements, many of the fundamental challenges and enablers to responding to GEC/CC under investigation have much wider relevance across southern Africa and, indeed, globally. This chapter provides the background for each of the research questions, further rationale for the study and considers the research gaps it addresses. The chapter concludes by providing an outline of the thesis structure and some key findings from the results chapters.

1.2. Introducing the research objectives

The overarching aim of the thesis is to investigate, comparatively, responses to climate variability and change/GEC at the local government and community scales, with a focus on adaptation. Several key research questions, framed as objectives, need to be answered to achieve this aim. The objectives centre on the two main thematic layers

outlined above. The following sections provide the background and justification for the four core research objectives summarised in Table 1 below.

Table 1: Research objectives

Research Objectives	Results chapter that addresses the objective
1. To undertake a comparative analysis of whether, to what extent, and how processes of adaptation are taking place in the neighbouring eThekwini metropolitan and rural Ugu district municipalities	Chapter 5
2.To determine the relationship between Ugu and eThekwini and between these municipalities and higher government spheres, and the likely effect of collaboration, or lack thereof, on global environmental/climate change adaptation initiatives	Chapter 6
3. To explore differing perceptions and understandings of climate variability and change and their likely effects within and between the case study sites	Chapter 7
4. To investigate divergent experiences and responses to GEC within the case study sites and consider the influence of municipal-public relations in constructing them	Chapter 8

1.3 Adaptation to global environmental/climate change

The Intergovernmental Panel on Climate Change's Fourth Assessment Report (IPCC AR4, 2007) confirms that evidence of cumulative human impacts on the climate is unambiguous and the effects are already being felt. Chapter 2 summarises the nature and likely implications of projected GEC/CC for southern/South Africa. In short, according to the IPCC (AR4 Synthesis Report, 2007) predicted temperature increases, sea level rise and increased rainfall variability in Africa will, *inter alia*, exacerbate water stress and compromise agricultural productivity, human health, vital infrastructure and biological diversity. Therefore, Africa has high levels of biophysical and social vulnerability as distinguished theoretically in Chapter 2.

These broad predictions are widely accepted and it is now well established that anthropogenic greenhouse gas (GHG) emissions will continue to transform the climate into the future, even if stringent mitigation measures are taken rapidly (Pittock, 2009; Parry, 2009). Moreover, despite the existence of international policy frameworks and tools (e.g. United Nations Framework Convention on Climate Change (UNFCCC)

adopted in 1994 and the linked Kyoto Protocol adopted in 1997) to regulate and mandate GHG emissions among developed countries, mitigation progress has been frustratingly slow and insufficient with global emissions continuing to rise (Munasinghe and Swart, 2005).

This combination of factors has shifted the GEC/CC debate and a new paradigm focused on addressing and responding to the unavoidable existing and predicted impacts of GEC/CC and sea level rise (adaptation) now complements approaches focused on preventing GEC/CC causes (mitigation). Historically, the adaptation agenda was challenged by critics from science and policy circles who viewed adaptation as defeatist and a means to escape the responsibility of restricting environmentally degrading activities (Forsyth, 2003; Heinrichs et al, 2009). Nevertheless, adaptation has emerged as a key strategy from local to global scales, partly facilitated by the UNFCCC's and IPCC's support for adaptation, as well as burgeoning evidence of the unavoidable adverse effects of GEC/CC (Kern and Alber, 2008).

At this point, it is important to distinguish between climate change and the broader term global environmental change used interchangeably in this thesis. CC has always existed as part of the natural functioning of the dynamic systems comprising the Earth. However, current concern arises from the fact that human activities (e.g. burning fossil fuels) have begun to accelerate CC (i.e. anthropogenic CC) through intensifying atmospheric concentrations of naturally occurring GHGs (Pittock, 2009). Article 1 of the UNFCCC defines human-induced CC as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods". The IPCC defines CC as "a statistically significant variation in the mean state of the climate or its variability, persisting for an extended period (typically decades or longer)" and "may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use". Thus, the UNFCCC definition accounts only for anthropogenic change, while the IPCC definition allows for both 'natural' climate variability and causes of CC, as well as CC attributable to human activities that alter atmospheric composition and climate variability.

It is widely acknowledged that, in reality, the distinctions between CC and climate variability may be difficult to make (Hulme et al, 1999). However, the key point is that anthropogenic CC will affect climate variability and extremes (i.e. these are key manifestations of CC). Therefore, appropriate adaptation strategies to CC should include these aspects. It is appropriate to consider jointly CC and variability, while recognising that CC poses drastic (albeit still uncertain) changes to the frequency and magnitude of extreme events and other aspects of existing climate variability (Pittock, 2009).

A broader concept than CC, GEC encompasses non-climatic environmental dimensions and can be defined simply as the set of biophysical transformations of land, oceans and atmosphere, determined by an interdependent system of socio-economic, political and natural processes (Odada et al, 2008). More complexly, GECs are "those that alter the well-mixed fluid envelopes of the Earth system (the atmosphere and the oceans) and hence are experienced globally, and those that occur in discrete sites but are so widespread as to constitute a global change" (Vitousek, 1992: 1-2). The former category comprises changes in the atmospheric compositions, decreased stratospheric ozone concentrations and CC. The latter category includes changes in atmospheric chemistry, species loss, deforestation and land use change (Vitousek, 1992). The above two components can similarly be classified into two types of co-occurring GECs, namely, systemic and cumulative GEC, where the former (e.g. GHG emissions) impact directly on globally functioning systems, and the latter (e.g. groundwater pollution) impact through worldwide distribution and magnitude of change (Lohnert and Geist, 1999).

A major feature of GEC is that these two categories of change occur simultaneously and compound each other. CC, land use and land cover change and urbanization are all key aspects of GEC (Kalnay and Cai, 2003). Thus, as Simon (2012) explains, not all facets of GEC are governed principally by CC since, for example, land use change is arguably shaped more by livelihood-related strategies than by CC. I prefer the broader approach of GEC; however the terms GEC/CC are used interchangeably in this thesis to facilitate analysis and discussion. Further, in accordance with Adger et al's (2005a: 2) proposition, GEC, "is best understood as processes that are manifest in localities, but with causes and consequences at multiple spatial, temporal and socio-political scales"

and that these processes are amplified by and amplify prevailing socio-cultural and political-economic trends of globalisation.

Adaptation to GEC/CC is deemed particularly urgent for developing countries where societies and government bodies are already battling to deal with development needs and challenges associated with climate variability (Adger et al, 2003). The IPCC's AR4 (2007) lists Africa as the continent most vulnerable to GEC/CC. Such acute vulnerability is shaped by existing unfavourable conditions and pervasive multiple interacting stressors, including inadequate infrastructure and exploitation of natural resources, widespread poverty and high disease burdens, which are likely to be exacerbated by adverse GEC/CC impacts. As such, CC can be understood as a 'threat multiplier' because it compounds existing social, economic, political and environmental challenges (Crate and Nuttal, 2009). Moreover, CC threatens the attainment of the Millennium Development Goals (MDGs) by their target date of 2015 and the prospects of longer-term sustainable development.

Adaptation to GEC/CC is fundamentally linked to, and thus cannot be considered in isolation from, development paths and decisions (Schipper and Pelling, 2006; Schipper, 2007; Parry, 2009; Simon, 2011). In many instances, not least in the SA context, development is based on unsustainable and inequitable neoliberal principles, which often serve to exacerbate, rather than reduce societal vulnerability. As with all development decisions, GEC/CC adaptation decisions and linked actions have far-reaching intra- and inter-generational justice implications (Adger et al, 2006; Pelling, 2011). Regarding biophysical vulnerability to GEC/CC in SA, projected changes in temperature, precipitation, sea level rise, and increased severity and frequency of extreme events threaten, *inter alia,* agricultural productivity, coastal zones, the quality and quantity of already stressed water resources, and biological diversity. These GEC impacts are differentially distributed and are shaped by existing differential vulnerabilities and adaptive capacities of SES.

The SA national government has made progress in developing a CC roadmap, through, for example, the National Climate Change Response (NCCR) White Paper (2011)[4]

[4] As the most recent document reflecting SA national government's CC policy position, the NCCR White Paper (2011) is predominantly drawn on in this thesis. Major foci between this Paper and the earlier Green Paper (2010) remain largely unchanged. However, there are a few significant changes highlighted in Sections 6.4 and 7.3.2.

where adaptation is recognised as a critical response. Moreover, adaptation planning and implementation of adaptation measures have commenced in the SA context, particularly within larger metropolitan areas. Nevertheless, there is a dearth of adequate knowledge and empirically informed research on, *inter alia,* the combined intricacies of GEC/CC perceptions and vulnerabilities within different contexts and relevant governance considerations at all levels that shape actions and policies, specifically in terms of adaptation. There have also been increasing calls (e.g. Parnell et al, 2007; Roberts, 2008; Sharma and Tomar, 2010) for mainstreaming or embedding GEC/CC adaptation into existing development and governance agendas in order to be elevated on political agendas, particularly in the so called 'developing world' context characterised by pressing development goals. The SA national government and several local governments, including eThekwini, support the mainstreaming approach (Roberts, 2008; NCCR White Paper, 2011). However, several questions still need to be answered before this can be seen as an optimal way forward. For example, what are the underlying driving forces of differential vulnerability and do current development trajectories exacerbate rather than alleviate such disparities and injustices? And, what is the status of adaptive capacity and the contributing factors thereto? These are some of the important questions that I explore in the thesis.

1.4. Responding to GEC/CC at the municipal and community level scales: A focus on human dimensions

Guided by political ecological insights, I emphasise the coupled nature of human-environment or SES, but am particularly interested in the human dimensions of GEC/CC, including societal adaptation to climate variability and change. Human dimensions of GEC encompass "the causes and consequences of people's individual and collective actions, including the changes that lead to modifications of the earth's physical and biological systems and that affect the human quality of life and sustainable development in different parts of the world", and societal adjustments to environmental change (Jäger, 2000: 33). My particular focus is on what can be understood as the less tangible, yet fundamental, underlying socio-cultural and politico-institutional influences on GEC/CC adaptation operating at individual and collective state and non-state levels.

Political ecologists have long recalled that individual and household decisions and actions are influenced by the environmental conditions and context-specific socio-

cultural influences, political economies and institutional frameworks within which they are embedded (Neumann, 2005). Therefore, finer scale (i.e. individual, household and community levels) perceptions, responses and vulnerabilities to climate variability and change are embedded within and constructed through the influence of a complex institutional landscape that includes diverse multi-scale government and non-government institutions.[5] It follows that an analysis of local scale GEC vulnerabilities and adaptive possibilities needs to account for the governance context within which these occur.

The pivotal role of municipalities in devising and implementing CC adaptation actions is now well established in CC literature (see Chapters 2 and 5). Moreover, there is a rapidly expanding literature on enablers and constraints to municipal action in both 'Northern' and 'Southern'[6] contexts, where it is often suggested that municipalities stand to benefit from transnational municipal networking (e.g. through best practice and information exchange) and drawing from approaches developed elsewhere. The importance of this notwithstanding, comparably little attention has been paid to the specificities of municipal contexts, shaped by context-dependent factors, including unique cultural and social influences and the possibilities and challenges to locally created and thus locally appropriate municipal policies. By extension, despite being a seemingly obvious issue, the role and complexities of localised municipal collaboration, such as between contiguous municipalities that share critical infrastructure, human settlements and ecosystems has hitherto been under-researched and theorised in the context of GEC/CC, particularly in the global South. This thesis is concerned with addressing these research gaps.

Few studies have undertaken the specific type of empirically-based analysis applied in this research and I argue that it is particularly important in the SA and other African contexts where, due to various historical and current influences, tangible support from provincial and national institutions is weak or absent and local governments are often juxtaposed in terms of resource capacities and lack an institutional history of co-operation. Such disparities need to be considered for long-term sustainable adaptation

[5] The term institution, as applied in this thesis, includes "formal organisations as well as customs, and patterns of behaviour and action" (Jones, 2009).

[6] Also referred to as 'global South' and 'global North', this distinction (although contested) is widely used in academic literature to compare so called 'developing' and 'developed' contexts.

measures to be introduced. The role of international and regional level collaborations (despite their problematic nature) for addressing GEC/CC and the broad argument for multi-scalar governance is widely emphasised in GEC and sustainability literature. However, from a research and policy perspective, inadequate attention is still given to the importance and complexity of finer scale horizontal and vertical relational dynamics between municipalities and other tiers of government, as well as non-state actors. Recognising this issue, the role of complementary engagement between municipal, provincial/state and national governments and other non-state actors for effective and adaptive governance and adaptation measures are thus central concerns in this thesis.

Municipal and local public perceptions and actions are understood as being closely linked in a bi-directional relationship. Local citizens have an important role to play in adapting to GEC/CC and rallying and challenging government over policy decisions and actions. Thus, it is important to complement the first layer of research with empirical investigations of local perceptions, responses and vulnerabilities to GEC/CC. While there is a growing body of research focused on these issues, this study adopts an unusually holistic approach in that culturally diverse households from across the socio-economic and rural-urban spectrum in neighbouring municipalities are investigated. I view this as important to gain novel insights into differential understandings of and adaptive capacities to GEC/CC between diverse socio-cultural groups, often in close geographical proximity. These disparities need to be questioned and have important implications for adaptation possibilities and constraints.

While there are no universal definitions, urban, peri-urban and rural areas are commonly differentiated according to population density, land use, access to services and predominance of adults in non-agricultural employment. Typically, rural areas are defined as having low population densities, often with limited services, under-developed key infrastructure and large tracts of land devoted to agriculture. Urban areas are commonly defined according to high population density, concentrated economic and human activities and more extensive service provision than rural areas. Peri-urban areas straddle the interface of urban and rural zones and have a combination of typical urban and rural features and functions.

Broad categorisations for this thesis are based on official local municipal classifications and I chose specific study neighbourhoods based on access to key services and other factors outlined in Section 4.6, rather than density of living. As such, the urban/suburban study sites are not characterised by high-density inner-city living conditions and therefore issues associated with such conditions are not specifically investigated. Further, the study sites (predominantly residential areas) are at varying distances from the city centre, with varying characteristics and were selected to give comparability of suburbs, townships, rural settlements and informal living conditions between the different municipal areas. A further key criteria for site selection was recent experience of flooding, intense storms or other extreme events and because inner-city residential areas had, at the time of research, not had significant experience of such events they did not form a subject of this research (see Section 4.6 for detailed site selection criteria and justification).

1.5. Theoretical underpinnings

A diverse theoretical background, outlined in Chapter 2, frames this study. However, the interdisciplinary theoretical body on political ecology (PE) is the central framing theory. PE can be broadly understood as a field that explores complex relations between political economy and ecology and is concerned with identifying a chain of explanation through interconnected scales (Robbins, 2004). PE provides a powerful framework that allows for multi-scalar analyses of social and cultural influences on GEC/CC while accounting for power relations between diverse actors and networks.

PE strongly acknowledges the questioning of the role of underlying structural social, economic and political forces, ideas and agendas in creating and maintaining certain orders that influence livelihoods and vulnerabilities to GEC/CC. PE seeks to "uncover the social and political conditions that produce environmental change, but also the conditions that shape whether and how that change is perceived and responded to" (Lazrus, 2009: 22). While I find PE theory effective for guiding this study I extend and complement this through developing a PE of adaptation to GEC that brings together diverse theory and literature such as an 'ecological approach to environmental rights' (after Bosselman, 2001) in the SA context and Swidler's (1986) theory on 'cultural toolkits'. In developing this landscape of theoretical innovation I show how limitations of applying PE thinking to understanding GEC adaptation at various scales can be

addressed through applying complementary literatures and that a PE lens alone may be insuffice. PE theory also underpins the approach to multi-level governance that this thesis develops. Figure 1 in Section 2.1 depicts the PE of adaptation to GEC/CC framework developed in this thesis.

This research is also explicitly 'geographical', specifically linked to the broad discipline of development geography. Geographical dimensions of scale, place and location are central considerations for adapting to GEC/CC (Bulkeley, 2005). These points may seem mundane but despite their significance and the central contributions that geography as a discipline stands to make, geographical work has been hitherto 'at the boundaries' (Hulme, 2008: 5) or margins of GEC/CC studies. Moreover, I argue that geography's deep seated pre-occupation with understanding and theorising the relationship between knowledge and power and society/culture and nature offers an effective lens for understanding perceptions and responses to GEC/CC. This research thus responds to disparate calls (e.g. Hulme, 2008; Moser, 2010) to recognise the unique role that geography has to play in GEC studies through applying well-developed geographical insights, integrated with PE theory.

1.6. Thesis structure and overview

In this introductory chapter I have provided an overview of what the thesis is about and highlighted main focal points. I have also provided the rationale for my study and outlined the research aim and objectives (see Table 1). Chapter 2 presents the diverse theoretical background to this research and identifies key aspects and approaches from some of the pertinent literatures on which it is based. This includes various theories and approaches to adaptation, vulnerability and livelihoods analysis in the context of GEC/CC. As highlighted, PE is the main theoretical body that I draw on for framing this research and developing an understanding of the complex multi-scalar issues that this thesis investigates. Complementary governance, justice and cultural literatures are also outlined in Chapter 2. Chapter 3 provides important background and contextual information about the broader legislative, institutional and developmental framing context within which empirical investigations are grounded. This chapter also traces important milestones in the development of SA's CC policy.

Chapter 4 presents the research approach, highlighting the interdisciplinary principles underpinning the study and the methodology for empirical data collection. Multiple social science methods were applied to answer the research questions, including in-depth interviews, surveys, focus groups as well as policy and institutional analysis. Data collection and analysis for this thesis is derived from interviews and texts focused on predominantly formal/canonical systems (i.e. formally constructed or statutory institutions) not informal/shadow systems. The latter are touched upon through engagements with informal grassroots organisations (e.g. Ghandinagar FVC and RSP ratepayers association) but an in-depth investigation is beyond the scope of the thesis.
While I do not develop or propose a (particularly novel) methodological approach, the comparative multi-scalar nature of empirical investigations is unusual within GEC/CC research and adds unique insights. Chapter 4 also presents contextual information about the municipal research sites and a brief synopsis of likely GEC/CC implications, and justification for the choices of case study locations within the two municipal areas. With the foundational and theoretical structures in place, Chapters 5 to 8 present the empirical results.

Presentation of results has been logically divided into four chapters, structured around the two key interrelated research layers already described. Chapter 5 addresses the first research question, comparatively investigating eThekwini and Ugu municipalities' responses to GEC/CC with a focus on drivers and barriers to adaptation. Results show that rural and under-capacitated Ugu municipality lags behind eThekwini, to a significant degree, in responding to and planning for climate variability and change. Disparities and similarities between the neighbouring municipalities' adaptive capacities are also analysed. The chapter presents novel insights (e.g. regarding supposed environment versus development dichotomy) into municipal drivers and constraints to adaptation, some of which are experienced similarly in both municipalities and others more specific to either municipality. Picking up on and developing the issues of municipal and provincial relationships raised by interviewees stated in Chapter 5, Chapter 6 investigates horizontal relations between Ugu and eThekwini, and vertical relations between these municipalities and other governance spheres regarding GEC/CC agendas. The likely effects of the identified inadequate collaboration between multiple government spheres for GEC adaptation are discussed and key constraints (e.g. ineffective communication channels and competing priorities)

to multi-scalar governance identified. In light of these, suggestions for fostering multi-scalar governance and strengthening bi-directional linkages between government (as well as non-government) actors are outlined.

Building on the first two results chapters, Chapters 7 and 8 shift focus to the local household and neighbourhood-scales to address the third and fourth research objectives respectively. Chapter 7 explores differential perceptions and understandings of climate variability and change across the socio-economic spectrum and diverse cultural contexts. I propose that this analysis is crucial because understandings of the implications of GEC/CC and predicted impacts have a direct bearing on whether, and to what extent, anticipatory adaptation takes place. This investigation reveals the centrality of cultural frameworks or 'toolkits' (after Swidler, 1986) including folkloric or traditional beliefs, as well as religious faith in shaping perceptions and, by extension, responses to climate variability and change in the study contexts. Analysis of these findings adds an important contribution to nascent efforts to centrally account for socio-cultural influences that combine to either constrain or facilitate GEC/CC adaptation.

Developing the research further, Chapter 8, the final results chapter, presents an analysis of divergent experiences and responses to climate variability (specifically extreme weather events) among households in the diverse study sites. Here, analysis is focused on a multidimensional understanding of vulnerability and livelihoods. Emphasis is on understanding present vulnerability and adaptive capacity to climate variability as an important proxy for gaining insights into future adaptation possibilities and constraints. Principal emphasis is on understanding divergent vulnerabilities and adaptive capacities between households in the different study sites and identifying key drivers of vulnerability as well as enablers of adaptation.

Findings from the various sites within Ugu, more specifically Umdoni local municipality (ULM) and eThekwini also provide important insights into municipal − public relations and the political ecology of vulnerability to climate variability and change. The power of inequitable political and economic interests that underpin inequities and injustices between different social groups is revealed. In light of this and guided by PE insights, the chapter concludes with the argument for addressing the root causes of vulnerability and a focus on transformative adaptation and adaptive

governance. Chapter 9 concludes the thesis by presenting a synopsis of the main arguments and findings of the study, revisiting the research objectives and outlining how these have been addressed throughout the thesis. The chapter also elaborates on the intellectual contribution of this research to the field of study and, in this light, suggests policy applications and possible directions for future research.

1.7. Conclusion

In sum, the multi-level and cross-scale research approach adopted in this study provides holistic insights into human dimensions of climate impacts and contributes important knowledge about constraints and opportunities for adaptation in the SA context and more broadly. While writing up this thesis in my London working environment, detached from my empirical study contexts, news reports from home and the international arena are a constant reminder of the importance of the type of research I have embarked on. Earth systems are under immense pressure; our human population has recently reached a landmark 7 billion (UN, 2011) and continues to grow rapidly; increasingly concentrated in overburdened urban areas. Unsustainable practices and injustices pervade. Globally, the past few years have been characterised by climatic 'records' in various regions, widespread devastating extreme events, and financial and developmental crises. These unprecedented conditions require transformative and unprecedented responses.

Drought is currently devastating interlinked human and ecological systems in the horn of Africa. In the space of a few months in late 2011, floods have ravaged Bangladesh, Pakistan, and Thailand, leaving trails of destruction and livelihood losses, while hurricanes and cyclones have impacted the United States, Mexico and the Philippines. Regarding my broad study context, tornado-like events have been a prominent destructive feature in recent years across the SA landscape (e.g. the most recent and extremely devastating tornado in Duduza, Free State province in October 2011). In October and November 2011 KZN also experienced several destructive storm events.

Regardless of uncertainty about whether these climatic events are 'evidence' of GEC/CC, their adverse impacts, often including devastation and fatalities, show that society is inadequately prepared for and adapted to such events. Importantly, it is the already vulnerable and marginalised who are repeatedly the most affected and least able

to respond and adapt to adverse climatic conditions and events (Adger et al, 2003). It is my hope, that in some way, this thesis can contribute to a greater awareness of such injustices and to advance adaptation agendas in the study contexts. Personally, this thesis journey was sparked by my interest in contributing increasingly important insights about how we can adapt to, and with, pressing environmental changes, especially in my broad study contexts, the place I call home, which has experienced major progressive developments, but many deep challenges remain.

Chapter 2: Literature review and theoretical approach

2.1 Introduction

Chapter 1 outlined the key objectives of this thesis and provided justification for its focus and the research gaps it addresses. This chapter charts the theoretical background to the study and identifies the key bodies of literature it draws from. In this way, the chapter develops a sound theoretical underpinning for analysis and presentation of my empirical research results in Chapters 5-8. Chapter 1 explained that much empirical research is still needed to understand place-specific and multi-scalar GEC/CC adaptive possibilities within diverse SES, and the underlying drivers shaping divergent vulnerabilities. In responding to this research gap, my thesis comprises two key interconnected layers of analysis, namely the municipal and local household to neighbourhood layers, brought together under a multi-level analytical framework. Various theoretical insights are adopted to guide these scales of analysis, as exemplified in this chapter.

As the overarching theory and approach for this thesis, PE offers important insights for the critique and development of GEC/CC adaptation measures. As outlined in Section 1.5, P.E can be broadly understood as a field that investigates complex and dynamic relations between political economy and ecology and emphasises the inseparability between environmental change and the broader political-economic context (Robbins, 2004; Bradnock and Saunders, 2000) (see Section 2.7 for an in-depth discussion of PE). However, as with all theory, PE has limitations and as explained in Section 1.5 I develop a PE of adaptation to GEC/CC framework (see Figure 1 below) by bringing together diverse theory and literature in order to create an inclusive and effective approach for understanding climate change adaptation opportunities and constraints.

Figure 1: Framework depicting the theoretical components for a political ecology of adaptation to climate change

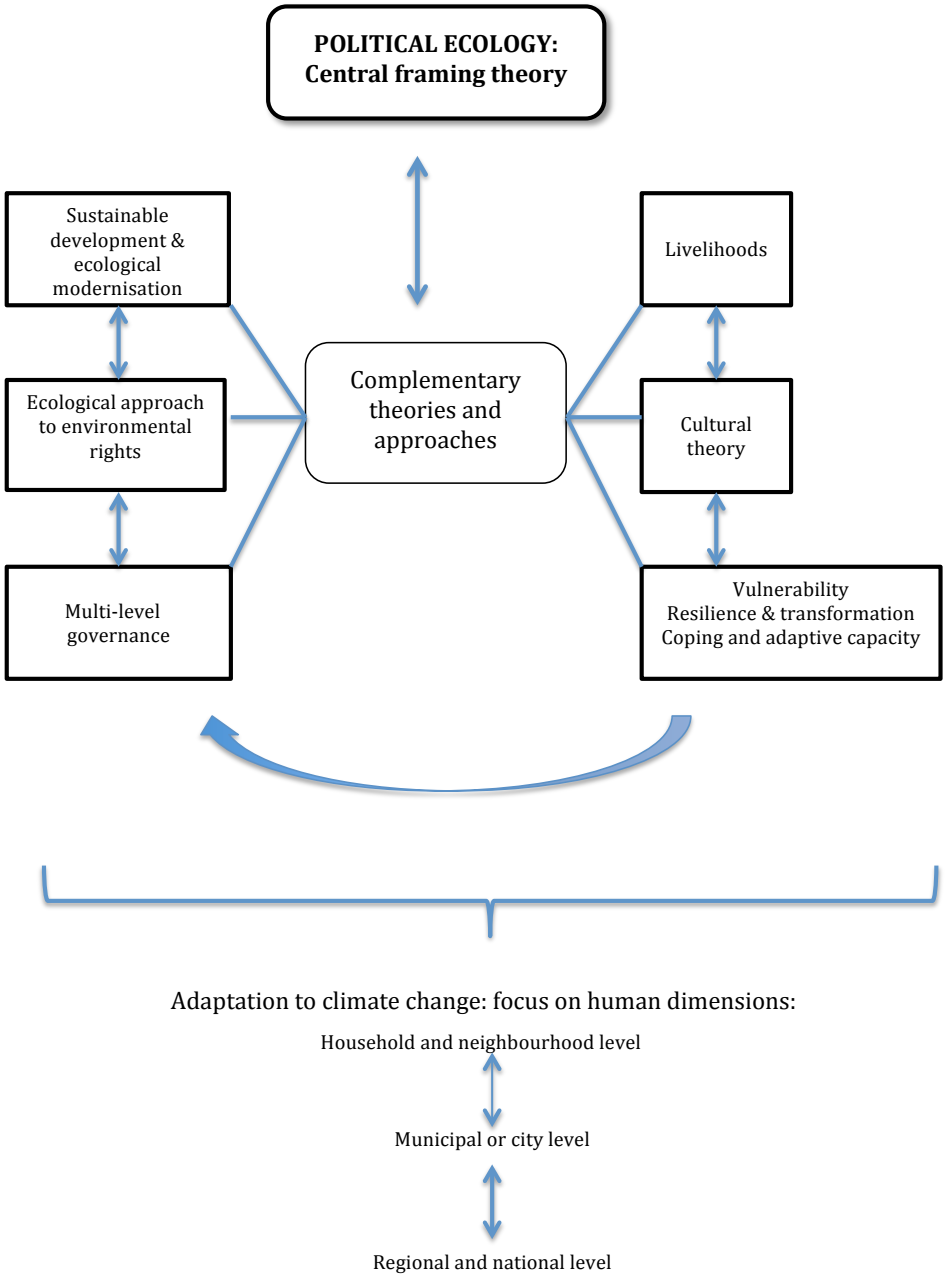

Figure 1 depicts the landscape of theoretical innovation for this thesis where PE is the central framing theory but is complemented by the combination of insights from, amongst others, livelihoods, vulnerability, adaptation/coping and cultural theory as well as governance and environmental/social justice literature. While there are tensions associated with combining different approaches in a holistic framework, I find it useful to draw critically from these literatures within a broad political ecological perspective in

order to identify both structural and agency constraints and potentials to GEC/CC adaptation at multiple scales.

As evident from the connecting arrows in Figure 1, the theoretical bodies and approaches are not mutually exclusive but are drawn on in a complementary manner to form a diverse interconnected theoretical paradigm. However, the different theories and approaches are represented and grouped in different boxes to create a clear visual depiction of the components that comprise the overall theoretical approach for this thesis. As closely linked literatures, sustainable development and ecological modernisation have been paired together in the same box. Similarly vulnerability, resilience and transformation and coping and adaptive capacity theory and approaches are grouped in the same box. Evidently, the complementary theory and approaches depicted in the diagram are, for the most part, of equal importance to the theoretical model developed for this thesis – a PE of adaptation to GEC/CC. Multi-level governance, environmental rights, livelihoods and cultural theory and approaches are represented in individual boxes and are linked to other components, to varying degrees, throughout the thesis (as illustrated by the arrows in Figure 1). For instance, vulnerability and adaptive capacity are core components of livelihoods.

Swyngedouw and Heynen (2003) highlight that PE theory is beginning to shape an improved understanding of the interwoven processes that create uneven environments and can thus guide studies which address questions of justice, as this thesis does. While PE is characteristically concerned with socio-environmental injustices, I argue that it is necessary to develop a contextually appropriate approach to environmental and social justice in the context of GEC adaptation and therefore draw on insights from Bossleman's (2001) approach of ecological human rights (see Section 2.8.2) to do this. Further, I show how PE can be complemented by insights from a livelihoods approach to account for multiple and interlinked livelihood factors shaping vulnerabilities to GEC/CC. As critical aspects of society-nature relations, government institutions and structures – specifically local authorities as the principal vehicle for GEC/CC adaptation at local scale – are investigated through a PE lens, combined with multi-level governance literature. The contours of the theoretical framework depicted in Figure 1 are explained further throughout this chapter and applied throughout the thesis.

The remainder of this Chapter unfolds as follows: first, adaptation theory and concepts are introduced and I explain the way in which adaptation is framed and applied in this thesis. Following an analysis of the distinction between coping and adaptive capacity, the chapter develops a comprehensive framework for interpreting and analysing vulnerability and adaptation to GEC. Focus is on the starting-point approach to adaptation and my understanding of vulnerability is informed by the rubric of political ecology (PE). Following this, I introduce the notion of transformative adaptation, which goes beyond resilience, and the interlinked concepts of sustainable development and ecological modernization are briefly considered thereafter. The second part of the chapter outlines the overarching PE theoretical approach that guides the thesis. Swidler's (1986) complementary cultural toolkit is then charted as an effective conceptual framework for cultural analyses. To conclude the chapter, a multi-level governance framework is developed to guide the multi-scalar analyses characterising the thesis.

2.2 An introduction to mitigation and adaptation to GEC/CC

There are two overarching active strategies for addressing human-induced GEC, namely mitigation and adaptation. Within the CC literature mitigation refers principally to actions taken to reduce or limit net emissions of GHGs – the main *cause* of anthropogenic GEC (Smit et al, 2009). Such actions include reducing fossil fuel (e.g. coal) use, using renewable energy sources (e.g. solar power) and enhancing GHG sinks (e.g. forest cover) to limit the amount and rate of CC. Mitigation can also refer to actions taken to address adverse *impacts* of GEC (from occurring or getting worse) which entails strengthening or revising existing activities to lower their impact or limit their vulnerability (Simon, 2010).

As a complementary overarching strategy, adaptation is a response (precautionary or reactive) to the unavoidable existing and predicted sudden and slow-onset impacts of GEC (Schipper, 2007; Simon, 2010; Huq and Reid, 2009). While mitigation is vital to prevent anthropogenic CC from accelerating, adaptation needs to be pursued concurrently since, "even aggressive mitigation would not prevent all climatic changes and associated impacts" (Munasinghe and Swart, 2005: 50). Therefore, they should not

be seen as competing, but instead complementary approaches.[7] Until relatively recently, the predominant focus of CC debates has been on mitigation (Heinrichs et al, 2009). However, largely due to increasing evidence of unavoidable CC impacts, more urgent arguments in favour of adaptation approaches, based on robust decision-making instead of, "optimal decision-making predicated on the predictive accuracy of climate models" have emerged in policy and academic debates (Dessai et el, 2009: 65). Whilst emphasising the synergies between the strategies, this thesis is primarily focused on adaptation and the linked notion of adaptive capacity (Chapter 1 provides justification for this focus).

2.2.1 Adaptation to climate variability and change: a focus on human dimensions

Human or societal adaptation to climate and weather has existed since the beginning of the *Homo sapiens* species. However, we are currently concerned with the need to adapt to unprecedented rates and scales of environmental and climatic change due to anthropocentric interference (Munasinghe and Swart, 2005). Such circumstances may well exceed current adaptation practices and abilities (Sanchez-Rodriguez, 2005).

In the context of GEC/CC, adaptation (simply put) refers to taking action to suit changing environmental conditions and climatic attributes. In recent years research on adaptation, particularly related to the human dimensions of GEC/CC, has escalated to the extent of acquiring "its own discourse and science" (Schipper, 2007: 10). Current GEC/CC literature incorporates insights from diverse fields such as biology, anthropology and economics, which have variously engaged with the notion of adaptation to environmental stresses for many years (Pelling, 2011). My interpretation of and approach to adaptation are influenced by diverse traditions, including sociology and anthropology studies. These influences will become apparent in the following section and throughout the thesis.

Adger et al (2009: 19) explain that, "Adaptation is a social process with implications for ecosystem services, economic and political stability, and culture, among many other things." Therefore, adaptation is as a dynamic *process*, continually evolving as new information and parameters emerge, not an end point or 'fixed state of harmony' (after

[7] There are often co-benefits between the two categories, such as green roofing projects (a roof of a building that has been covered with vegetation atop a waterproof membrane), which lead to increased CO^2 absorption together with regulated building temperatures and other synergistic benefits.

Dryzek, 1997). The definition's reference to cultural implications of adaptation is particularly important for this research. The role of culture is returned to in Section 2.10, where I argue that not only does adaptation have cultural implications, but also culture has significant implications for adaptation. Moreover, from a PE perspective, adaptation plans and actions should be understood and analysed in a broader context of interconnected socio-economic, cultural, institutional and political structures, which form a location-specific context for human-environment interactions (Smithers and Smit, 2009).

Building on the above definition, Schipper (2007: 6) explains cogently that, "As a response and planning strategy, adaptation is characterised by its objective to adjust human systems to a *different* set of external parameters in a *sustainable* and *long-term* manner that focuses on adjusting the *entire system* rather than simply those components of the system that are affected" (emphasis added). Implicit in this definition is the contention that effective human adaptation to GEC is shaped by the ability of individuals and society to adjust to adverse impacts that might threaten livelihoods in such a way that linked environmental, social, political and economic systems do not break down. In this light, while my main focus is on social or human dimensions of GEC, I underscore the importance of comprehending the intricate connections of coupled SES and society-nature relationships, which influence adaptation (Smithers and Smit, 2009). SESs can be understood as constituting bi-directional relationships between human characteristics (values, perceptions and behaviours) and the biophysical factors of the ecosystems in which people live, resulting in a resilient or vulnerable pathway directed either toward sustainability or unsustainability (Alessa et al, 2009). Inherent to the SES concept is that human agency and structures are central to and inseparable from nature, thus rendering nature-society dualisms arbitrary.

2.2.2 Categorising adaptation processes

To some extent, both human and 'natural' or ecological components of SESs will adapt naturally to GEC; however, planned adaptation can facilitate this process (Munasinghe and Swart, 2005). While widely, but not universally acknowledged, the distinction between autonomous ('spontaneous', 'automatic') and planned ('deliberate', 'strategic') adaptation is often made (Smit et al, 2009: 76-77). It is broadly accepted that unmanaged natural systems undergo autonomous adaptation, public agencies initiate

conscious, hence planned, adaptations and adaptations undertaken by private individuals and communities may be autonomous or planned, or a combination of both (Smit et al, 2009). While many have found these distinctions useful, I argue, in agreement with Adger et al (2005b: 78) that, "individual adaptation actions are not autonomous: they are constrained by institutional processes such as regulatory structures, property rights and social norms associated with rules in use". Indeed, adaptations at all levels, not just the individual scale, are influenced by broader structural factors.[8]

Adaptation is also commonly distinguished according to the timing at which it occurs, relative to the stimulus: anticipatory versus reactive adaptation (Smit et al, 2009). Adaptations in unmanaged natural systems are viewed predominantly as reactive, whereas adaptations in socio-economic systems are generally seen as being either reactive or proactive, depending on the situation. Proactive adaptation is becoming increasingly urgent so that predicted harmful CC impacts can be reduced or avoided and any beneficial opportunities seized (Munasinghe and Swart, 2005).

In addition to these two typologies, adaptation processes can be divided into two broad categories. The first category relates to adaptations that focus on adjusting infrastructure and technology ('hard' measures) while *maintaining* existing livelihoods and behaviour and attitudes. The second category comprises adaptations that focus on the need to *change* attitudes, behaviour, address inequitable power relations and policy ('soft' measures) and adapt livelihoods to new climatic conditions in recognition that some 'hard' adaptations may be exceeded by such unprecedented conditions (Schipper, 2007). While it necessary to address 'hard' adaptation measures (e.g. restructuring storm water systems), my empirical findings show that a greater focus on 'soft' measures (e.g. worldviews, environmental decision-making power dynamics) particularly relating to cultural and social influences is also essential. Addressing such 'soft' measures is necessary for creating the enabling conditions for adapting to GEC (Agrawal and Fankhauser, 2008; Mdluli and Vogel, 2010).[9]

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[8] Further, while more applicable to human systems, planned adaptation can also 'assist' natural systems to adapt (e.g. through creating protective structures for wetland mangroves) (Berkes et al, 2003).

[9] However, 'hard' and 'soft' measures are intricately related and should be simultaneously considered. For example, ecosystems services straddle hard/physical boundaries and are affected by 'softer' behavioural related issues regarding their value and use.

2.2.3 Adaptation at various scales and the possibilities of maladaptation

Due to its multi-scalar nature interconnections and long-term outlooks are central to adaptation and, if not accounted for, well-intended adaptations can inadvertently lead to 'maladaptation' (the opposite of, or 'no adaptation') (Smithers and Smit, 2009). Heyd and Brooks (2009: 275) define maladaptation as "the pursuit of policies and practices which make people more vulnerable to changes in the natural environment in which human systems are embedded." Not all adaptation actions are equally beneficial to all and often there can be negative externalities resulting from adaptive actions and vulnerabilities can be shifted from place to place or amongst social groups (Dow, 1992; O'Brien and Leichenko, 2009; Satterthwaite et al, 2009). For example, implementing irrigation systems in water-stressed areas could increase water scarcity for the greater region (Kiker, 2000). Government policy and action, such as approving developments in unsuitable locations such as floodplains and estuaries known to be vulnerable to predicted CC impacts could also lead to maladaptation (see Chapter 8). Maladaptation is also closely related to adaptive capacity and the concept is useful for elucidating why pointed vulnerability considerations are critical to adaptation planning (Satterthwaite et al, 2009).

With this framework on adaptation in place, adaptive capacity, which is intricately linked to adaptation, is discussed in the following section.

2.2.4 Adaptive capacity

Adaptive capacity is closely related to adaptation, yet it "represents *potential* rather than actual adaptation" (Brooks, 2003: 9). Adaptive capacity is influenced by access to resources and assets that influence abilities to make adaptation investments and actions. Adaptive capacity is also intricately linked to vulnerability (Handmer, 2009). Therefore, it is the adaptive capacity of systems and their components that need to be understood for determining likely adverse GEC impacts.

Adaptive capacity is highly uneven and varied across and within societies. However, the capacity to adapt is dynamic and constantly shifting due to multi-dimensional and multi-scalar factors such as culture, technology, entitlements, economic and natural resources and governance (Brockhaus and Kambire, 2009). Therefore, low levels of adaptive capacity can be strengthened through beneficial or supportive influential

factors. Institutional frameworks and governance dynamics create the framing conditions for adaptation and adaptive capacities. Policy frameworks, institutions and governance regimes influence local level adaptive capacities, while local level actions and capacities simultaneously influence institutions and governance. These scalar concerns provide the motivation for this thesis's multi-layered and nuanced approach that considers local case study communities in conjunction with municipal and higher level units of analysis. These issues are further conceptualised under the rubric of multi-level governance in Section 2.11.

Adaptive capacity can be inhibited by external factors, even if willingness and resourcefulness for adaptation exist (Adger et al, 2007). Conversely, supportive external factors can enhance adaptive capacity and processes. Thus, the lingering tendency to understand vulnerability and adaptive capacity principally through endogenous factors − the attributes and behaviour of vulnerable populations − with insufficient attention to the broader political and socio-economic context associated with vulnerability needs to be overcome. As Ribot et al (2009: 122) explain, attention to these factors will help "to trace out the chains of causal forces and relations that imping on a given instance of environmentally related vulnerability". Assessing both adaptation and adaptive capacity and their relationship is highly complex due to the many interconnecting factors these encompass. Assessing adaptation is premised on past and present actions, whereas adaptive capacity can be assessed in relation to the present as well as the future since it concerns the potential of a unit of analysis to adapt (Vincent, 2007). Adaptive capacity investigations also need to recognise that existing capacities may not be drawn upon, when required, to facilitate adaptation because this is dependent on contextual factors and uncertainties such as political unrest, or, at the individual scale, behavioural or psychological reasons (Adger et al, 2009).

2.2.5 Distinguishing between coping and adaptive capacity

At this juncture, it is important to distinguish coping from adaptive capacity. In livelihood and famine studies, coping is often assumed to be an inherently positive thing and has become somewhat fetishized (Marais, 2011). Munasinghe and Swart (2005: 176) cogently explain, "While the emphasis in adaptive capacity is on actively mitigating adverse consequences of climate change, the emphasis in coping capacity is on living with the consequences". Implicit in the notion of coping capacity is the ability

to return to the status quo or 'get by' within the coping range, as opposed to overcoming existing barriers and threatening conditions that lead to insecurity in the first place, which can mask underlying inequalities and trade offs (Roncoli et al, 2009).

Coping is generally short-term in its approach and reacts to temporary system disturbances. Adaptation strategies can be potentially more transformative and actively attempt to transcend the existing coping range and reduce vulnerability to shifting environmental conditions, from a longer-term perspective (Munasinghe and Swart, 2005; Marais, 2011). Thus, strengthening adaptive capacity is especially important in the African context where many societies are already deemed to be at the edge of their coping capacity. In reality, adaptation and coping may be difficult to distinguish because they, "will unfold simultaneously and continuously in shaping human-environment relations" (Pelling, 2011: 39). This noted, for analytical and policy formulation purposes, it is useful to distinguish between these two aspects while noting the complexities and overlaps between the two categories (Munasinghe and Swart, 2005; Pelling, 2011).

2.3. Developing a comprehensive framework for interpreting and analysing vulnerability and adaptation to GEC

2.3.1 Vulnerability: a brief introduction

Vulnerability is a contested concept that is defined and applied in many, often overlapping ways in diverse disciplines such as food security and natural hazards research. Vulnerability is widely investigated in GEC/CC research, with both natural and social scientists endeavouring to assess vulnerability through different approaches and interpretations. Given the complexity of understanding vulnerability, there is increasing support for cross-fertilisation between different research community's efforts to address vulnerability. However, such integration is still questioned on the basis of often divergent theoretical and analytic underpinnings of different approaches, especially between the natural and social sciences.

Despite emerging opportunities for collaboration between GEC research and disaster risk reduction (DRR) insights, for example, there is still contestation over the scope and effectiveness for such interaction (Ireland, 2009). For instance, DRR is often concerned with reducing the impacts of one-off extreme events. On the other hand, the specific

nature of GEC as comprising both slow-onset and sudden impacts requires much deeper long-term and cumulative considerations than DRR has typically engaged in (Simon, 2010). These arguments noted and building on other definitions (e.g. Kelly and Adger, 2009; Pelling, 2003; Ziervogel et al, 2006), vulnerability is understood, in this thesis, as the degree to which people or SES are susceptible to harm, particularly in relation to GEC impacts or hazards, which interact with other concurrent social and environmental changes. Moreover, I understand vulnerability as being subjectively understood and differentially experienced. This definition is further unpacked in Section 2.4, in relation to the rubric of PE.

As with adaptation, the way in which vulnerability is conceptualised has significant policy and practice ramifications and thus requires explicit consideration (Dow, 1992). The following section reveals the close interconnection between the way in which vulnerability is framed and the type of adaptation approaches adopted and considers the implications thereof.

2.3.2 Biophysical and social vulnerability

A meta-analysis of the literature reveals that the two overarching biophysical and social vulnerability analytic approaches have broadly shaped interpretations of vulnerability, as well as approaches to GEC adaptation. Often applied in natural hazards studies, biophysical vulnerability approaches can be linked to the positivist school of thought. Biophysical interpretations principally rely on climate modelling and impact assessments to understand and predict vulnerability (Burton et al, 2009). Emphasis is placed on biophysical or natural environment stresses and hazard exposure, thereby leading to an understanding of biophysical vulnerability that is predominantly divorced from social contexts. Conversely, vulnerability approaches stemming from social schools of thought are informed by interpretative social sciences and emphasise the relative and 'constructed' nature of vulnerability (Cardona, 2004). As such, social vulnerability interpretations tend to be more focused on human dimensions of vulnerability and emphasises that vulnerability is mediated through, *inter alia,* economic, political, social and governance dimensions (O'Brien et al, 2004; Burton et al, 2009). These two approaches, which result in divergent interpretations of vulnerability and adaptation, require further analysis.

2.3.3 Biophysical vulnerability and the 'scenario-based' or end-point approach to adaptation

As Brooks (2003: 5) explains, "biophysical vulnerability is a function of the frequency and severity (or probability of occurrence) of a given type of hazard." Biophysical approaches are criticised for assuming vulnerability to be a somewhat static notion, determined principally by exposure to adverse climate impacts and overlooking human agency in mediating and shaping such impacts (McLuaghlin and Dietz, 2008). Hence the approach can lead to partial and deterministic understandings of vulnerability that may hinder, rather than facilitate appropriate GEC/CC adaptation (Dessai et al, 2009). Biophysical approaches to vulnerability link with scenario-based or 'first-generation' adaptation research.

First-generation adaptation research (also labelled 'end-point' and scenario-based adaptation research) was applied by the IPCC in the early 1990s to develop a proposed common methodology to guide CC research (Burton et al, 2009).[10] The approach has subsequently been adapted widely and applied in climate research on vulnerability and adaptation. Under this approach, vulnerability is the 'end-point' of analysis determined by a sequential assessment of GHG emissions trends, which feed into climate scenarios, biophysical impact assessments and the identification of adaptive possibilities (Kelly and Adger, 2009; O'Brien et al, 2004).

End-point vulnerability and adaptation research are linked to orthodox approaches to environmental science where vulnerability can assumedly be decreased through mitigating biophysical changes, deemed to be the principal cause of risk (Forsyth, 2003). Furthermore, emphasis is often placed on quantifying vulnerability in terms of costs, extent of impacts and so forth (O'Brien et al, 2004). Recently, concerns have been raised about the tendencies of techno-centric scenario-based approaches to be reductionist and overlook the policy context and underlying socio-cultural factors that influence exposure to environmental risk. Therefore, combined with inadequate key stakeholder participation and input, such approaches can inadvertently amplify vulnerability in certain cases (i.e. maladaptation) (Forsyth, 2003).

A defining feature of the first-generation adaptation approach is the selection and application of climate projections/scenarios derived from Global Circulation Models

[10] The IPCC Guidelines outlined a standard seven-point approach for adaptation research that was principally impacts driven (Carter et al, 1994).

(GCMs), which are overlaid onto biophysical and socio-economic systems to assess vulnerability (Dessai et al, 2009). In short, the end-point approach views vulnerability as the outcome of cumulative CC impacts minus adaptation (Kelly and Adger, 2009; O'Brien et al, 2004).

2.3.4 Limits of climate modelling and first-generation adaptation research

Computerised projections of future climate and global scale climate changes have been useful for raising awareness and placing CC firmly on policy agendas (Dessai et al, 2009). However, these are also underpinned by embedded assumptions and values that are not necessarily shared by people in different parts of the world (Forsyth, 2003; Dessai et al, 2009). Further, although considerably advanced, downscaling techniques generally provide information on global or regional scales and are thus inadequate for guiding location specific adaptation measures.

While not disputing the role of climate modelling,[11] I support the view (e.g. Dessai et al, 2009) that there is substantial evidence of the dangers GEC brings, and as an alternative to delaying action in anticipation of refined climate predictions, we should focus on robust rather than optimal decision-making regarding GEC adaptations. With this in mind, the applicability of the starting-point approach to this research is now discussed further.

2.3.5 Social vulnerability and the starting-point or second-generation approach

Linked to social vulnerability interpretations, the systems-based or second-generation/starting-point approach to adaptation and vulnerability has emerged as a response to the shortfalls of biophysical approaches (O'Brien et al, 2004; Burton et al, 2009). The approach, which guides my empirical analysis, supports robust decision-making and begins with assessing current vulnerabilities to climate variability and change through various methods and recognises vulnerability to be shaped by a multitude of interacting forces, of which biophysical impacts are one (Burton et al, 2009; Dessai et al, 2009). A distinguishing feature of the systems-based adaptation framework is a central emphasis on existing capacities and human agency (Huq and Reid, 2009). Vulnerability assessments are grounded in the present (hence labelled the

[11] Impact assessments deriving from both climate modelling and system-based approaches are both necessary for policy-making (Ribot et al, 2009).

‘starting-point’ approach) and in specific contexts. Therefore, in contrast to scenario-based tendencies, second-generation adaptation approaches do not assume that the most vulnerable are necessarily in the most biophysically vulnerable places (O’Brien et al, 2004).

Importantly, vulnerability assessments grounded in the present should still be *historically informed* since historical factors have influenced and continue to shape the present in both overt and covert ways in different localities. I support Huq and Reid’s (2009: 315) contention that the starting-point approach is, “the most appropriate approach to use when trying to identify current and future local risks to climate change” to guide adaptation decisions and measures. Hence, the focus of my empirical research for this thesis on the lived experiences and understandings of communities, and explicit attention to the specific vulnerability attributes of the communities in question, and how these are shaped by context specific factors. Such contextual factors include multiple interacting environmental, socio-cultural and economic processes, which combine with, and are exacerbated by CC impacts (Kelly and Adger, 2009; O’Brien et al, 2004).

Aligned with social vulnerability interpretations, systems-based adaptation frameworks develop more anthropocentric accounts of environmental vulnerability and draw “more attention to social, economic, and political factors that may reduce people’s access to resources to withstand biophysical events or changes, rather than the biophysical changes themselves” (Forsyth, 2003: 197). This explanation can be related to Blaikie et al’s (1994: 48) ‘access model’ of vulnerability to environmental hazards, which maintains that differential access to resources is a principal factor determining vulnerability. The access model is grounded in political economy theory as it is concerned with revealing and addressing the underlying structural causes of vulnerability, not only physical influences. Indeed, social vulnerability approaches predominantly emphasise structural and institutional influences and are thus often applied in political economy research (O’Brien et al, 2004).

Blaikie et al’s (1994) (and updated in Wisner et al, 2004) access model can be linked to and builds upon Sen’s (e.g. 1981, 1990) entitlement approach that is well developed in food security and famine literature. Political economy insights are central to the entitlement approach, which in essence argues that, “the extent to which individuals, groups or communities are ‘entitled’ to make use of resources determines the ability of

that particular population to cope with or adapt to stress" (Kelly and Adger, 2009: 165). Importantly, the concept of entitlements extends beyond income and material assets in defining wellbeing and includes considerations of cultural and social factors. Kelly and Adger (2009) propose that understanding the 'architecture of entitlements' is central to determining levels of vulnerability to GEC and climate stress.

The application of the second-generation approach in this thesis is justified by my main concern with human dimensions of GEC and understanding perceptions and responses to GEC. Importantly, however, guided by PE insights, this approach does not preclude the role of biophysical factors in influencing vulnerability and adaptive responses, but emphasises the connections between biophysical and social vulnerability and the interdependency between natural and social systems.[12] Several perspectives or theoretical viewpoints characteristically adhere to social vulnerability approaches. These include, but are not limited to political economy, constructivist, political ecology and social-ecological systems perspectives. The perspectives are not mutually exclusive but often overlap and draw from each other.

A principal contribution of political economy has been to emphasise the role that structural forces, inequalities and power play in shaping vulnerability. It is thus now widely accepted that vulnerability to GEC must be understood in the context of, and cannot be separated from, the broader political economy of resource use (Adger et al, 2003). These contributions notwithstanding, McLaughlin and Dietz (2008: 102) caution, "the more reductionist applications of political economy can discount the role of human agency and culture as well". Depending on standpoints, some political economists might contend this, however, I view PE insights as offering useful inroads to counteract possible reductionism associated with political economy (McLaughlin and Dietz, 2008). Political ecological insights principally inform my understanding of vulnerability applied in this research.

2.4 Understanding vulnerability and adaptation from a political ecology (PE) perspective

As the overarching theory guiding the study, PE is discussed in greater detail in 2.7. In short, PE combines political economy insights with an emphasis on the

[12] While there are marked variations in application, vulnerability approaches linked to social vulnerability schools of thought tend to be more holistic than biophysical approaches and increasingly emphasise the interconnectedness of social and biophysical vulnerability dimensions.

interconnectedness between socio-political and natural or physical systems (Biersack, 2006). Approaching vulnerability from a PE perspective recognises the importance of combining environmental, societal and cultural components in various proportions in order to gain an inclusive understanding of vulnerability (Oliver-Smith, 2004). Crucially, for the purpose of this research, PE also allows for constructivist accounts of agency and culture in analysing vulnerability and adaptation (Oliver-Smith, 2004; McLaughlin, 2008). Writing from a PE viewpoint, Oliver-Smith (2004: 11) explains that, "Vulnerability is conceptually located at the intersection of nature and culture and demonstrates, often dramatically, the mutuality of each in the constitution of each other". Nevertheless, the role of culture has been somewhat underplayed in vulnerability studies to date, particularly within GEC research (see Section 2.10).

I propose that, together with Swidler's (1986) complementary cultural toolkit framing (see Section 2.10), and drawing from constructivist insights, PE can provide a powerful lens through which to unpack the role of socio-cultural beliefs in shaping vulnerabilities. As McLaughlin et al (2008) explain, constructivist insights have significantly transformed our understanding of the key influences that agency and culture have in creating differential vulnerabilities between individuals and communities, even when confronted with the same or similar risks. Importantly, I follow a 'mild' form of constructivism, which, in accordance with PE, recognises that although interconnected with social systems, the biophysical environment or system is a strong influential force in shaping vulnerabilities as opposed to radical constructivist positions, which sometimes overlook this factor.[13] In sum, I concur with Oliver-Smith's (2004: 10) incisive statement that, "Vulnerability is fundamentally a political ecological concept."

Adger (2006: 268) explains that 'multiple stressors' and 'multiple pathways' of vulnerability are prominent features in much cutting edge vulnerability research. Indeed, along with several other studies (e.g. Reid and Vogel, 2006; Ziervogel et al, 2006; Drimie and Quinlin, 2009) these two features guide analysis and understanding in this research, where GEC/CC is recognised as one of many stressors that society is

[13] To clarify, the inference is not that the actual climatic event or biophysical force is socially constructed. Rather, people's vulnerabilities to such events are socially constructed through existing political-economic, socio-cultural mechanisms and underlying structural factors.

faced with and the multiple causal paths of vulnerability are considered. Moreover, recognition of both exogenous forces – in the form of external exposure to hazards and endogenous factors relating to internal abilities to adapt to such stressors is key (Ziervogel et al, 2006). Furthermore, given that vulnerability is not a static condition, but constantly shifting at different temporal, spatial and social scales, these dimensions need to be accounted for in vulnerability analyses (Kelly and Adger, 2009).

2.4.1 Micro and macro influences on vulnerability – considering structure and agency

Explicit in the above discussion is the contention that social vulnerability can be addressed only when both the proximate (e.g. income level, location, and housing structure) and underlying multiple structural causes (e.g. the wider political economy and government policies) – which are notably much more challenging to address than proximate causes – are understood and addressed. Therefore, understanding GEC/CC vulnerabilities requires a nuanced consideration of underlying structural causes as well as human agency (Wisner, 2009).[14] This approach is supported by Wolf and Moser's (2011: 547) assertion that, "There is forever a tension between structure and agency, which can only be acknowledged, but not resolved one way or the other". PE theory outlined in Section 2.7, and social vulnerability interpretations discussed above provide a solid foundation for this approach.

2.4.2 Investigating current vulnerability to gain insight into future adaptation opportunities and limitations

In accordance with the starting-point approach discussed above it is vital to understand current vulnerability, as it comprises the benchmark from which any diminution of vulnerability via adaptation must take place (Brooks, 2003). Current vulnerability is shaped by past and present influences. It is current vulnerabilities to climate variability (including extreme events) that are discussed and analysed in this thesis (Box 1 clarifies these terms as applied in this thesis).

[14] I recognise that combining structure and agency in analysis is challenging and radical proponents of either viewpoint might argue that the two cannot be combined. However, in support, this combination is widely applied in PE studies and is the essence, for instance, of Tony Giddens' (1986) influential structuration theory.

Box 1: Definitions of climate and extreme events

Climate variability:
"Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability)" (IPCC Working Group 1, Appendix I: Glossary, 2007).

Extreme weather events:
"A weather event that is rare at a particular place and time of year. These occur naturally with a low frequency, but this frequency may change with climatic change either natural or anthropogenic. They often cause damage because systems are not well adjusted to cope with them. The frequency of extreme events changes rapidly with changes in average conditions" (Pittock, 2009: 331).

Assessing CC impacts and constraints and facilitators to adaptation is tentative since no single climate event, or even several events constitute(s) proof of CC and there are immense difficulties in predicting future climatic conditions (Agyeman et al, 2007). However, as Burton (2009: 17) explains, "For current variability, an improved understanding of individual and societal adaptation not only provides insights for estimating future adjustment, but also helps address current problems of sustainable development in light of variable and uncertain environments". As such, this research is concerned with investigating the current 'adaptation baseline' to climate variability, as well as the absence of other adaptations that might be used, but which are blocked off or difficult to use for whatever reason to provide insight into limitations and opportunities for future adaptations to GEC (Burton, 2009).

The conceptual framework charted above provides a solid basis for interpreting and analysing vulnerability and adaptation throughout the thesis. As O'Brien et al (2004) explain, the central foci of second-generation adaptation research is to understand the causes and divisions of vulnerability to help reveal adaptation options and barriers and to help develop policy and other measures that reduce vulnerability. These are central concerns of this thesis.

2.5 Vulnerability, adaptation and resilience: a conceptual framework

The study of human dimensions of GEC/CC is terminology-laden, with many concepts such as resilience and vulnerability being closely related and often described in relation to one another (Vogel et al, 2007). Although often approached from different epistemological viewpoints, there are strong synergies between vulnerability and resilience research (e.g. common recognition of the interaction between endogenous and exogenous processes and applicability at multiple spatial and temporal scales) (Adger 2006). While a theoretical analysis of all relevant terms is beyond the scope of this Chapter, several clarifications need to be made.

2.5.1 From resilience to transformative adaptation

Rooted in ecological research (Berkes et al, 2003), the notion of resilience has recently received a flurry of attention in the GEC/CC literature where its usefulness and novelty as a term and approach is strongly debated. While there is no universally applicable definition, in relation to GEC, resilience can be defined basically as "the means of exploiting opportunities and resisting or recovering from the negative effects of the environment", which are shaped by both exogenous and endogenous factors (Huchzermeyer, 2004: 42).[15]

In line with Simon's (2012) views, my understanding of sustainability encompasses resilience as a central characteristic, thus avoiding the need for the application of a specific resilience paradigm as variously proposed in the literature (e.g. Olsson and Folke, 2004; Berkes et al, 2003). The key point is to reveal the elements of resilience that can enhance and sustain adaptive capacity and adaptation of SES to GEC, as well as exogenous and endogenous forces that may threat to erode such resilience.

While resilience is important in the face of GEC threats, the concept has also been somewhat fetishised, and depending on the way it is interpreted can be open to similar critiques to the notion of coping described above. Pelling (2011: 170) explains that, "From the perspective of adaptation, resilience is made distinct because of the aspiration

[15] Resilience is commonly understood as the antonym of vulnerability (Ernstson et al, 2010). However, I support the alternative view that a vulnerable system (and constituent components) does not necessarily mean that it has no resilience, rather it is more vulnerable to changes that could previously have been adapted to (Adger, 2006).

of maintaining functional persistence". In other words, implicit in common understandings of resilience is the ability to 'bounce back' (i.e. recoverability) to the status quo. However, if 'bouncing back' means restoring an acutely insecure livelihood and unsustainable development path, then more than resilience is required for such circumstances to be transcended. Thus, focusing primarily on building resilience runs the risk of further entrenching inadequate, unsustainable and unjust development paths and practices.

Pelling's (2011) proposed 'resilience – transition – transformation adaptation framework' provides a useful lens for explaining adaptation actions and intentions. Pelling (2011) explains that resilience, transition and transformation are three distinct levels of adaptation with specific intentions and actions. However, certain theoretical insights can be applied to foster understanding across all three levels (Pelling, 2011). Resilience and its connection to adaptation have already been explained. Transitional adaptation "is an intermediary form of adaptation that seeks to realise full rights under existing political and governance regimes" (Pelling, 2011: 170). Furthermore, where the mismatch between legal rights and their enforcement and application is significant (as in the SA context), transition is likely to be more aligned to transformational adaptation (Pelling, 2011). Transformative adaptation is concerned with addressing the root causes of vulnerability rather than simply the symptoms. In order for adaptation to be transformative, it must create opportunities for revision and replacement of existing development paths and social contracts, as well as protecting positive gains already achieved (Pelling, 2011). Pelling (2011) explains that no one type of adaptation (resilience, transition or transformation focused) is preferable, with judgements depending on viewpoints and context. I advocate that transitional and transformative adaptation should be striven for within the SA context, characterised by largely unsustainable development trajectories and pervasive social and environmental injustices.

2.6 Sustainable development, ecological modernization and GEC

The remit of this thesis precludes a full exposition of the extensive sustainable development and linked ecological modernization literature. However, a few key points require clarification.

Following the Brundtland Commission's Report (1987), sustainable development became a global catchphrase (as a discourse and an approach) (Hajer, 1995). The sustainable development agenda is rooted in concerns about impending environmental limits to economic development and supports economic growth and development that coincides with due environmental consideration and concern for social justice (Dryzek, 1997).

Despite ongoing debates about whether sustainability or sustainable development can exist or whether the paradigm can be put into practice, it remains a globally pervasive approach (Simon, 2003). In its simplest form, sustainable development can be defined as development that lasts. It is broadly understood in this thesis as a continuous process "that will (*inter alia*) permit continuing improvements in the present quality of life at a lower intensity of resource use, while leaving behind for future generations enhanced stocks of assets (i.e. manufactured, natural and social capital) that will provide undiminished opportunities for improving their quality of life" (Munasinghe, 2000, cited in Winkler, 2009: 21).

Environmental sustainability can be further divided into 'weak' and 'strong' versions (Goodland, 1995; Gibbs et al, 1998). Strong sustainability is holistic in its approach to the environment and assumes that although economic activity may be beneficial in some ways, it cannot continue unchecked, resulting in continual decline of environmental quality and functions (Gibbs et al, 1998). Further, proponents of strong sustainability do not assume human-made and natural capital to be perfect substitutes (Goodland, 1995). Proponents of weak sustainability presume a high degree of substitutability between human capital and natural capital. Weak sustainability approaches are generally not holistic as environmental impacts and economic and social activity are separately considered (Gibbs et al, 1998).[16]

Weak sustainability is a prominent policy approach and is linked to its sister discourse ecological modernization (EM) (Dryzek, 1997). The two concepts are similar in that they both support sustained development without straying from the path of modernization (Cohen, 2005). The basic storyline of EM is that through reconfiguration

[16] The distinction between weak and strong versions of sustainability is important because their application influences the manner in which the economy and the environment are integrated (Gibbs et al, 1998).

of the capitalist political economy and imaginative long-term action, economic development and environmental protection can be reconciled and support one another (Dryzek, 1997). The approach assigns a central role to science, technology and the state, which can lead to the subjugation of local or subaltern knowledges and experiences in decision-making processes (Gibbs, 2000). EM has become a dominant way of 'talking green' in spheres of environmental policy-making throughout both the developed and developing world and began to dominate environmental discourse from the mid 1980's (Hajer, 1995; Oelofse et al, 2006). Sustainable development and EM are widely accepted as policy paradigms for environmental decision-making in SA (including recent CC policy) and the flagship National Environmental Act (NEMA, Act 107 of 1998) (see Chapter 3) is arguably rooted in the assumptions of EM (Oelofse et al, 2006). EM is not technically an ideology but, combined with government's neoliberal outlooks, EM based approaches to environmental and development projects have become increasingly popular in the SA context such that EM has acquired a *de facto* ideological role in terms of guiding principles. This is not to say that EM is the only or necessarily most prominent current SA government rubric, but its influence is certainly recognisable in policy and practice. The influence of EM in shaping SA's pathway to addressing GEC is considered in Chapter 6.

Adaptation and sustainable development are closely linked, particularly because adaptation decisions raise questions of futurity, equity and fairness and have intra- and inter-generational consequences (Adger, 2006; Adger et al, 2009). Globally, sustainable development agendas have been manifestly unsuccessful, with unsustainable development persisting (Pelling, 2011). Simply 'adding on' adaptation to existing development pathways is thus insufficient because this would entail, "simply patching up a flawed development system" (Parry, 2009: 8). Therefore, in agreement with several others (e.g. Schipper, 2007; Parry, 2009; Pelling, 2011), I argue that CC is fundamentally a development issue and presents an opportunity to reconsider current (unsustainable) development paths.

The first part of the literature review has developed a conceptual framework for interpreting and analysing vulnerability and adaptation to GEC and highlighted that PE insights are drawn on to guide such analysis. The following section discusses PE theory and its applicability to this research in greater depth.

2.7 Political ecology: The central framing theory

The impact and severity of adverse GEC effects, both acute and chronic, are not determined solely by the nature of the physical event. As my research attests, the underlying social (including cultural), economic and political conditions in an area affected by GEC/CC are just as important as the event itself. PE theory provides a useful framework for understanding how social, economic and political factors make people more or less vulnerable to CC and limit or enhance their responses. Constraining factors can turn CC events into disasters and shift adaptation to maladaptation. The political economy of GEC/CC is critical to understand if risks associated with GEC/CC for interlinked social and natural environments are to be reduced.

Rooted in efforts to integrate cultural ecology with political economy, PE is a remarkably diverse and interdisciplinary field. Two key PE scholars, Piers Blaikie and Harold Brookfield (1987: 17), famously noted, "The phrase 'political ecology' combines the concerns of ecology and a broadly defined political economy". Thus, in essence, PE can be understood as a field that explores the complex relationships between politics and ecology. Firmly opposed to environmental injustice and inequality, PE entered mainstream research in the 1980s, marking a turning point for the generation of environmental knowledge and for thinking about environmental changes in interconnected political, ecological and social terms (Forsyth, 2008).

Despite core unifying ideas and theoretical thrusts, there are several plausible definitions of PE and rather than a coherent body or overall approach there are a multitude of different threads producing PE literature and insights (Simon, 2008). While PE was initially applied predominantly in rural contexts (e.g. Blaikie and Brookfield, 1987; Blaikie et al, 1994), there is now a growing literature of urban PE (e.g. Swyngedouw and Heynen, 2003; Loftus, 2005; 2007; 2009; Heynen et al, 2006; Heynen et al, 2008; Monstadt, 2009) especially within Anglo-American geography (Zimmer, 2010). Urban PE studies have introduced new topics and foci of analysis such as urban environmental justice and power over urban space, as well as conceptual resources drawn upon such as the notion of metabolism, employed in a critical sense to argue against an 'uncritical naturalisation' (Zimmer, 2010). Both PE urban and rural studies are drawn upon in this thesis.

Central to PE is the transcendence of urban-rural dualisms to an integrated and relational approach, which emphasises the interconnectedness of socio-ecological or biophysical and social processes, which produce highly even landscapes (Neumann, 2005). Therefore, my approach is guided by Smith's (1984, in Neumann, 2005) suggestion that PE research needs to be "framed by the unfolding geography of uneven development", which supports the ontological claim that nature and society are co-determining and are better conceptualised as a differentiated unity rather than discrete binaries. Therefore, PE serves as an appropriate theoretical platform for investigating the dynamic, interrelated socio-ecological processes that characterise urban, as well as peri-urban and rural areas (Swyngedouw and Heynen, 2003).

PE has become an established analytical approach for the investigation of environmental problems, which focuses on a critical analysis of political-economic, historical and socio-cultural issues instead of technocratic solutions (Blaikie and Brookfield, 1987; Peet and Watts, 1996; Bryant and Bailey, 1997; Neumann, 2005). By accounting for extra-local forces that influence local conditions, PE helps explain how local environmental problems are nested in and shaped by multi-scalar influences, not simply supposed characteristics and practices of local societies. Further, according to the PE paradigm, environmental problems such as GEC result from biophysical processes, together with multiple and compounding political-economic processes of development and socio-cultural systems, which human society both shapes and is intrinsically embedded in (Wisner et al, 2004; Lazrus, 2009).

Robbins (2004) offers some useful and broadly applicable insights into PE. First, he explains that political ecologists are opposed to *apolitical* understandings and explanations of environmental change and ecological processes. Furthermore, the myriad understandings and applications of PE can be synthesised to describe PE research as follows:

> "empirical, research based explorations to explain linkages in the condition and change of social/environmental systems, with explicit considerations of power. Political ecology, moreover, explores these social and environmental changes with a normative understanding that there are very likely better, less coercive, less exploitative, and more sustainable ways of doing things. The research is directed at finding causes rather than symptoms of problems." (Robbins, 2004: 12)

The above description of PE is applied in this research.

Two discernable dominant PE theoretical thrusts are political economy with an emphasis on the need to "link the distribution of power with productive activity" and ecological analysis, emphasising more broadly "bio-environmental relationships" (Greenberg and Park, 1994: 1).

PE emphasises that environmental changes cannot be separated from the political-economic context in which they occur. Building on this, PE strongly acknowledges the influence of underlying structural social, economic and political ideas, forces and agendas in creating and maintaining certain social and economic orders, as well as inequitable power relations that influence livelihoods and social vulnerability to GEC/CC (Bradnock and Saunders, 2000). As such, PE generally endeavours to link structure, agency and the biophysical environment (see Section 2.4.1). This is a complex task in reality but is viewed as crucial for gaining an inclusive understanding of the dynamic forces influencing GEC adaptation and revealing social and cultural barriers to adaptation.

As stated, central to PE is the understanding of complex nature-society or human-environment interactions, whilst emphasising the inappropriateness of the supposed nature-society dichotomy. Without invoking a human-nature dichotomy, it is also important to acknowledge the very real effects that biophysical processes have on people's lives and livelihoods. In other words, nature has powerful agency, as do humans. Understanding humans as de-coupled from natural systems and biophysical processes will ultimately exacerbate vulnerability (Berkes et al, 2003). In support of this view, Heyd and Brooks (2009) note that the lack of appreciation of the extent to which cultural and natural spheres are interlinked has been central to influencing our attitudes towards and interactions with the wider physical environment and the power of non-human agency for potentially impacting linked human systems.

Robbins (2004:12-13) provides a useful conceptualisation of PE frameworks as having a "Jeckyl and Hyde persona" or containing both a 'hatchet' and a 'seed'. As a hatchet, PE criticises mainstream environmental approaches and discourses held by powerful state and other authorities, particularly from the point of view of marginalised, vulnerable populations (Robbins, 2004). "It is a politicized acknowledgement of the co-production of environmental knowledge and social values in ways that, tentatively, try

to reconstruct environmental explanations and interventions in the favour of vulnerable people" (Forsyth, 2008: 762). By extension, PE studies often attempt to reveal how influential such dominant accounts and ideologies have been in conditioning political and detrimental environmental change. Robbins (2004: 12) cogently explains that PE "works to denaturalize certain social and environmental conditions, showing them to be contingent outcomes of power, and not inevitable". Through emphasising the importance of rethinking knowledge and considering power relations, PE can facilitate a restructuring of environmental understanding and politics. This would be a "more positive and interventionist approach to environment and social justice than classical positions" which would be of central importance to GEC mitigation and adaptation plans (Forsyth, 2008: 762).

Conversely, as a 'seed', PE research focuses on how sustainability and equity can be achieved in practice. Specific emphasis should be on local ways of knowing and understandings of environmental processes and examining the way in which individuals and households cope with and adapt to change, collaborate with others for united actions and build livelihoods (Robbins, 2004). Echoing the importance of the 'seed' aspect of PE, Loftus (2009: 954) argues that PE's central unifying idea is, "the desire to politicise environments as a way of changing them", not in the normative sense of imposing or privileging certain forms of knowledge, but to expose unequal power relations and dominance of certain actors and their knowledge claims over others. Framed by the above conceptualisation of PE, this research comprises both normative and critical insights and critiques.

There is no single methodology for PE research. However, as Neumann (2005: 6) explains, "multiscalar analysis has been a hallmark of political ecology, making it distinguishable from other approaches to human-environment relations". PE analysis is thus concerned with identifying a chain of explanation through different interconnected scales, ranging from the individual to the global level (Robbins, 2004; Simon, 2008).

2.7.1 Discourse analysis and framing literature as complementary analytical tools for PE research

Returning to the 'hatchet' aspect of PE's persona, PE encourages consideration of the influence of varying knowledge systems and discourses in environmental decision-making, rather than technocratic, deterministic analyses and solutions.

Discourse analysis and framing literature (see below in this section) can be an effective tool to help advance a politicised understanding of environmental explanations, experiences and understandings and uncover marginalised voices on the ground and how, if at all, these are accounted for in mainstream thinking and practices (Forsyth, 2008). Discourse can be defined as, "a specific ensemble of ideas, concepts and categorizations that are produced, reproduced and transformed in a particular set of practices and through which meaning is given to physical and social realities" (Hajer, 1995: 44). Discourse analysis focuses on eliciting people's perceptions and understanding of an issue through analysing their discourses or the words and language that they use (i.e. it is the study of 'language-in-use') (Hajer & Versteeg, 2005: 176).

Language, discourses, myths and stories are all core components of cultural 'toolkits' (after Swidler, 1986) (see Section 2.10) and are influential in shaping societies and their geographies. One of Michel Foucault's[17] (1984) most powerful theses was that "truth is an effect of power, one that is formed through language and enforces social order by seeming intuitive or taken for granted" (Robbins, 2004: 65). The role of power, particularly the interaction of power and knowledge, is central to this analysis. PE is centrally concerned with uncovering the political motivations and activities that underscore specific explanations of the environment and social systems that, through being constructed in powerful ways, by powerful actors, preclude alternative explanations. These are central issues explored in empirical investigations in Chapters 5-8.

From the late 1990s theories about 'framing', particularly from sociological studies, have been increasingly drawn on to gain insights into environmental conflicts and

[17] Michel Foucault was a French historian and philosopher whose writings on knowledge, power and discourse have been very influential in political science, geography, sociology and many other disciplines.

decision-making and to help untangle environmental issues. Drawing from Gray (2003), Buijs et al (2011:330) explain that a frame combines multiple purposes: " (i) Frames define issues; (ii) Frames shape actions and influence preferences for how a dispute should be resolved; (iii) Frames are used to justify our actions and (iv) Frames are used to mobilize others". Frames are thus powerful tools in deliberative governance.

'Cultural resonance' of frames strongly influences their effectiveness. Buijs et al (2011:330) explain that cultural resonance is achieved "when the content of a certain frame is congruent with specific items within a culture or subculture". This can be applied to individual, community and organisational cultures. The cultural resonance of a frame is influenced, *inter alia,* by its links to dominant beliefs and values, personal experiences as well as dominant storylines and myths. Leach et al (2007: 5) warn that, "there is a pervasive tendency – supported by professional, institutional and political pressures – for powerful actors and institutions to 'close down' around particular framings, committing to particular pathways", which can be difficult to transcend and transform.

Importantly, PE is concerned with revealing the socio-political conditions that shape environmental change and the underlying factors that influence whether and how such change is observed and acted upon (Lazrus, 2009). Thus, adopting a PE approach opens up the opportunity for examining the role of social factors, including culture in shaping livelihoods and GEC understandings and responses. In line with PEs 'Jeckyl and Hyde' persona described above, I centrally consider diverse cultural interpretations of GEC and how these can be accounted for in environmental policy-making. Notably, all understandings of the environment are politicised, and framed by broader power relations and political-economic structures and process (Robbins, 2004). However, it is generally the most politically powerful voices, with dominant vested interests that shape environmental decision-making and outcomes. Sayer (2006: 100) warns that poststructuralists "often lapse into a form of idealism in which it seems that anything can be constructed on the basis of any discourse, as if all discourses were infallible and hence all-powerful". Cautious of this criticism, the way in which discourse analysis is applied in this research avoids falling into this trap, through its integration with broader structural and other material and non-material influences. Critical evaluation of environmental discourses and approaches does not imply a rejection of science,

empiricism and the very real effects that biophysical and ecological events have on our lives. Rather, the point is to emphasise that scientific, indeed, all knowledge, must be "specified and contextualized geographically, historically, culturally and politically" (Neumann, 2005: 74).

Importantly, PE emphasises the importance of encouraging emancipatory outcomes of environmental policies and practices (Loftus, 2009). Forsyth (2003) argues that PE can potentially contribute to such emancipation through providing more inclusive means to acknowledge local environment concerns in environmental decision-making. Nevertheless, PE does not romanticise so-called local or lay knowledge and understandings as preferable or reject the importance of linked scientific discourses and other knowledges. A critical politicised understanding of *all* environmental knowledge and explanation is necessary. Drawing on my empirical research results, I show in Chapter 7 how multiple knowledges co-exist and overlap in the way we make sense of the world. However, the key point is that scientific viewpoints often taken as scientific law or fact represent specific, dominant viewpoints and interests about nature-society relationships, assumed to be true due to their widespread use, but often fail to account for local realities and conditions. Often, scientific viewpoints further entrench nature-society dualisms (Robbins, 2004).

Notably, PE has been effectively applied in GEC research that addresses similar core issues to those in question for this research (e.g. Pelling, 1997; Loftus, 2005; Lazrus, 2009). For instance, Pelling's (1997) research in Georgetown, Guyana, grounded in a PE approach, reveals that limited sets of adaptations (to the risk of flooding) for marginalised residents occupying risky areas can largely be attributed to the *politicized nature* of urban planning and control administered by the state (Pelling, 1997). In the SA context, planning and control are certainly notorious for their highly politicised and discriminatory nature, both in the apartheid era and at present. The Georgetown situation is mirrored widely, including in the eThekwini and Ugu municipalities, where marginalised and poorer residents occupying risky land such as floodplains and often have very limited adaptations options and capacities in comparison to wealthier middle- and high- income residents (see Chapter 8 for empirical investigations).

Key to the success of municipal GEC initiatives will be the input, support and co-operation of the individuals and households affected by such initiatives. Thus, the investigation of the relationship between the two municipalities and the actors on the ground in handling and adapting to the risks associated with climate variability and GEC effects comprises a central objective of this study. Together with insights from the multi-level governance framework and Moser's (2009) decision-centred diagnostic approach described below, PE provides an effective framework to guide this investigation of the politicised relationship between government officials and departments, actors on the ground and the ability to cope with and adapt to the risks of GEC. SA's discriminatory past is still etched in the landscape and the social ecology of the country, while current development paths and GEC/CC actions have compounding justice and vulnerability implications.

PE is principally concerned with uncovering injustices and underlying root causes of vulnerability; an aspect that governments and other agents are often less willing to address given that it is usually in their interest not to challenge the status quo, especially not to any radical extent. It is now widely acknowledged that people least able to cope – generally poor and marginalised populations − with the impacts of GEC are likely to be most exposed to such effects (Adger et al, 2003; Paavola et al, 2006; O'Brien and Leichenko, 2009). This uneven distribution falls both between and within countries and local areas. eThekwini and Ugu municipalities are excellent micro examples of unevenly distributed impacts of GEC and uneven adaptive capacities between the starkly contrasted middle- to high-income populations and low-income populations, living in close proximity. As highlighted in Section 2.3.5, due to varying factors, social vulnerability is differentiated at various scales, even when biophysical vulnerability or exposure to biophysical threats is the same.

Ironically, the affluent, high-income populations are generally more responsible for fuelling adverse environmental change through their high consumption lifestyles and maladaptive developments such as luxury coastal properties, but who are currently less vulnerable to GEC than poorer, marginalised populations with considerably less responsibility for causing the problem. The injustice of this situation is stark. Differential vulnerabilities need to be confronted if municipal and other plans for adaptation are to progress in a just manner. Differential vulnerability is due, in large

part, to underlying structural factors and the broader workings of the political economy (O'Brien et al, 2004). Just as Loftus (2009:953) argues, "The injustice of water poverty is one of the starting points for work on political ecology of water", I argue that the injustice of differential GEC impacts and abilities to cope with and adapt to such impacts should be the starting point for this work focusing on the PE of adaptation to GEC. Simon (2007a: 9) explains that, "vulnerability to disaster and the impacts of gradual GEC erode the rights and opportunities of the urban poor". In this vein, Swyngedouw and Heynen (2003) highlight that PE is beginning to create an improved understanding of the interwoven processes that create uneven environments and can thus guide studies, which address questions of justice and equality. Effectively, the utility of PE for addressing justice concerns in GEC research is captured in the following quote, "Political ecology attempts to tease out who gains from and who pays for, who benefits from and who suffers from particular processes of socioenvironmental change" (Swyngedouw and Heynen, 2003: 910).

As evident in the above analysis, adopting a PE approach brings environmental and social justice considerations to the fore. The following section develops a conceptual framework for addressing environmental and social justice issues in GEC responses, with particular reference to the SA context.

2.8 Understanding environmental/social justice in the context of GEC

Justice or fairness should be central to inherently long-term adaptation agendas and processes if existing inequalities and injustices are not to be deepened (Adger et al, 2009). This is also crucial to assuring that those who benefit from GEC adaptations are not disproportionately the middle class and elites, as has been the case with 'development' (see also Simon, 2010). However, given the unprecedented impacts and challenges it poses, GEC is likely to create new vulnerabilities and the more affluent and less marginalised populations may also become highly vulnerable, thereby transforming existing maps of vulnerability. This research is acutely aware of this, hence my focus not only on poor and marginal populations.

2.8.1 The development of a locally relevant and innovative environmental/social justice framework

Since its early beginnings in civil rights activism against exposure to hazardous waste and heightened pollution levels in the US, and other developed countries, the concept of environmental justice is now broad in scope and the guises of injustices to which it is applied (Bulkeley, 2006; Williams and Mawdsley, 2006). Environmental justice movements have proliferated in recent years within GEC/CC debates on the role of Northern production and consumption patterns in creating environmental burdens that are disproportionately experienced by poor and marginalised populations in the South (Leichenko and Solecki, 2008; Adger et al, 2009).

In order to be just and robust, adaptation policies and practices need to account for local biophysical, environmental, socio-cultural and politico-economic conditions (Simon and Fragkias, 2008). As Forsyth (2008: 763) says, "the challenge for political ecology lies in understanding both environmental and political change in ways that enhance social justice, but which do not impose *a priori* notions about each". Resonating with PE theory, Gare (2001: 116) argues that "an approach is required which takes into account diversity of perspectives and diversity of voices and which acknowledges the need to respect these even when opposing them". Of particular importance is engaging with people on the ground to understand the implications of climate variability and GEC/CC for their everyday lives, because, ultimately, although influenced by external forces, the meaning of the justice is grounded in and shaped by local contexts; it is socio-culturally specific (Smith, 2005). Certainly, each locality has unique traits that any interventions need to be accounted for in order to be effective (i.e. environmental justice is inherently geographical) (Bulkeley, 2006).

With regard to maximizing environmental justice, Semmens (2001: 77) suggests that in order to minimize what Haraway (1991) refers to as "the 'god trick' − the view from nowhere" − we begin by "adopting the subject posture of the border crosser intellectual which welcomes diversity and acknowledges voices exiled from mainstream disciplinary discourses". To achieve this, he suggests important theoretical and practical insights can be drawn from various multi-discursive fields, notably PE (Semmens, 2001). Given SA's heterogeneous multicultural context, it is particularly important to account for such situated knowledge.

Situated knowledge of particular environments and how this knowledge is produced may not be familiar to decision-makers and dominant actors' understandings (Loftus, 2007). Moreover, individuals conceptualise environmental/social justice in different ways. It follows that effective resolution of environmental disputes will necessarily require that people's background perceptions of justice – shaped by value judgements and personal experiences – are accounted for (Tully, 2001, in Gleeson and Low, 2001). While it is crucial to account for situated knowledge and multiple understandings of the environment, it is also important not to be idealistic and create unrealistic expectations about the outcomes of the constrictive realities of participatory and inclusive research and policy-making processes (Tully, 2001). Certainly, in any negotiations, asymmetries of power, knowledge, influence and resources will have an unavoidable role to play (Tully, 2001). Justice is not an-end point but a process, continually negotiated and reworked. Environmental decision-making and justice concerns can thus be perceived as ongoing agendas, which constantly need to be renegotiated at multiple scales thereby allowing more stakeholders to be heard than in once-off negotiations (Gleeson and Low, 2001).

2.8.2 An ecological approach to environmental rights in the South African context?

In SA, social and environmental justice are constitutional rights. However, environmental issues are often perceived as a hindrance to development agendas and human rights rather than an essential underpinning, which has created major challenges to meeting these rights (Roberts, 2008). Such perceptions are understandable in light of colonial and apartheid era injustices and inequalities, where marginalised communities often suffered land and other livelihood losses in the name of environmental protection, for example (McDonald, 2002; Patel, 2010) (see Chapters 3, 5 and 6). These injustices notwithstanding, it is also necessary to encourage a democratic shift in mind-sets to view environmental protection and development as 'two sides of the same coin', if the effects of GEC can be adequately understood and addressed (Parnell et al, 2007). Moreover, conceptualisations of environmental and social justice in SA (by civil rights movements, governments and hegemonic institutions) have been influenced by US-led applications, often without adequately considering unique SA traits.

With this in mind, and building on the above analysis, it is necessary to question what an appropriate broad environmental/social justice agenda would entail in the face of pressing GEC concerns. For the purpose of this research, an 'ecological approach' to environmental rights is proposed as offering insights for balancing ecological and human rights concerns. In contrast to the approach of individual human rights, which generally views the environment as a 'good' to be included in the list of individual demands, the ecological approach to environmental rights advocates that the environment is a condition of all life on earth (Bosselmann, 2001). The predominant human-centred character of environmental rights, partly reflected in the SA Constitution's Bill of Rights (1996) is viewed as somewhat problematic, particularly since such anthropocentricity is seen as perpetuating the "values and attitudes that are at the root of environmental degradation" (Bosselmann, 2001: 125).

The approach of ecological human rights attempts to bring together the philosophical foundations of human rights and ecological principles, thereby fostering a link between intrinsic values of humans and the intrinsic values of other species and the environment (Bosselmann, 2001). As such, "human rights (such as human dignity, liberty, property and development) respond to the fact that the individual exists not only in a social environment, but also in a natural environment" (Bosselmann, 2001: 127). The notions of respect and responsibility are also invoked by this approach; respect and responsibility for other humans as well as for the intrinsic value of environment (e.g. ecosystems, biodiversity). This is an essential point since the contention that with rights come responsibilities is often underplayed in justice debates and on the ground. This relates to Pelling and Wisner's (2009:8) conceptualisation of the 'social contract', which is the product of the interaction between individual rights (e.g. housing in SA), and social responsibilities - constraints on individual behaviour for the societal good (e.g. safe building codes). For them, the emergence of the environmental crisis can be understood, largely, as a failure in the social contract.

Importantly, the approach advocates a balance in terms of anthropocentric and ecological concerns in environmental/social justice frameworks. Notably, human rights are not absolute and just as they can be limited by social and democratic concerns, they can similarly be influenced by ecological considerations. The main point is to highlight the necessity of placing environmental concerns such as GEC within a balanced

environmental/social justice framework in order to prevent deepening antagonisms towards environmental protection. As Bosselmann (2001: 119) contends, "Beyond the existing multiplicity of cultures and values, there seems to be a deeply embedded sense that life as whole is to be respected: people ought to respect each other as well as the natural environment".

I argue that the frequent tension between economic development (brown agenda issues) and environmental protection (green agenda issues) in the SA context can be blurred when citizens are encouraged to recognise the interdependency between the two and view them as integrated rather than parallel, conflicting agendas. Furthermore, I have attempted to highlight the inappropriateness of awarding primacy to ecological or human dimensions in the pursuit of environmental/social justice. Rather, I have emphasised their complementarity. Chapter 8 considers the ecological approach to environmental rights in greater detail in relation to my empirical research findings.

In order to comprehensively account for justice concerns it is important to understand people's livelihoods and the threats that GEC poses to such livelihoods. As a core component of this research, I now outline the analytical lens for understanding livelihoods in this thesis.

2.9 Defining livelihoods and key contributions of livelihoods research

Livelihoods research is principally concerned with the multiple ways in which individuals and households construct their livelihoods, or broadly make a living (Agrawal and Perrin, 2008).

Blaikie et al (1994: 9) classically define livelihood (s) as:

> "the command an individual, family or other social group has over an income and/or bundles of resources that can be used or exchanged to satisfy needs. This may involve information, cultural knowledge, social networks, legal rights as well as tools, land, or physical resources."

As such, livelihood production is dynamic, complex and multidimensional, comprising several interconnected components.

Recently, livelihood frameworks have been applied in GEC-related studies (e.g. Reid and Vogel, 2006), helping to reveal the contextual and multifarious nature of livelihood vulnerability and adaptive capacity to GEC, shaped by both climatic and non-climatic factors.

2.9.1 Livelihood approaches: contributions and criticisms

Since the 1990s the 'Sustainable Livelihoods Approach' (SLA) and linked Sustainable Livelihoods Framework (SLF) has been particularly influential in livelihood and vulnerability studies (Bohle, 2007).[18] SLA promotes an actor-orientated approach and multidimensional understanding of livelihoods centred around five types of 'capital' or assets that constitute livelihood production: human, social (including cultural), natural, economic and physical capital (Bohle, 2007). In addition to capital resources, entitlements and access, and social relations are commonly cited and researched as key livelihood variables (Murray, 2002; King, 2011). Departing from structural and instrumental analyses characteristic of the 1970s and 1980s, livelihoods studies build on micro- and actor-orientated household studies that proliferated in the 1980s. While not negating the important contributions of this focus, critics (e.g. De Haan and Zoomers, 2005; King, 2011) warn that by isolating the micro-scale for analysis (including assets and social networks), livelihoods research has tended to understate fundamental structural, socio-economic and political factors – including institutions and organisations − that influence livelihood production and vulnerability.

A further criticism is the tendency to analyse livelihoods in overly materialist ways, downplaying important spatial, historic, political, as well as cultural and other symbolic dynamics (de Haan and Zoomers, 2005; Francis and Murray, 2002; Simon, 2008). Therefore, although effectively applied in many other studies, my analysis does not follow the traditional DFID (1999) or similar livelihood paradigms. Instead, I adopt a broader perspective and explicitly consider structural and other interrelated factors in shaping livelihood vulnerability and responses to climate variability and change. Guided by other studies that follow a similar approach (e.g. Bebbington and Batterbury, 2001; Murray, 2002; King, 2011), I advance this through a distinctly geographical and PE perspective.

[18] Initially applied in rural areas and recently adapted to urban contexts (Simon, 2008), the SLA was developed by a number of scholars (e.g. Chambers and Conway 1991; Scoones, 1998) and has since been advocated by the UK's Department for International Development (DFID) and other agencies.

2.9.2 Applying political ecology and human geography insights to livelihoods analyses

Understanding space as central to livelihoods analysis

PE's focus on complex networks and networked relations assists the theorisation of livelihoods as "fluid systems that are entangled in horizontal and vertical linkages that are constructed and reconstructed through relationships that are often spatially and temporally variable" (King, 2011: 300). The reciprocal relationship between space (as a facilitative or constrictive mechanism) and livelihoods requires careful analysis. In other words, livelihoods need to be theoretically and analytically 'spatialised' if they are to be properly understood. Human geography insights can help show the complex interconnections between livelihood and spatial production and reproduction (King, 2011). SA has a history of pronounced spatial and social regulation rooted, for example, in the construction of separatist native reserves allocated to African populations under colonial rule and a racially and socio-economically divided apartheid landscape with 'white' spaces being particularly privileged and well-developed (McDonald, 2002).

These historical geographies and spatial economies continue to interact with contemporary systems to shape livelihoods and space in dynamic ways and there is a distinct geographical variance between, as well as within rural (previously allocated as homeland and tribal space), peri-urban and urban livelihood patterns and opportunities. Moreover, institutional frameworks govern land access, land use, development, property rights, capital and commodity markets and are thus central forces in creating and reinforcing livelihood opportunities, inequalities and vulnerabilities. Referring to the SA context, Francis (2002: 546) explains, "formal institutions and many informal institutions have long operated so as to create insecurity for the vast majority of the population". Thus, the intricate links between livelihoods, vulnerability, institutions and the production and reproduction of space require careful analysis. In light of institutional centrality, I support Francis' (2002: 550) view that it is necessary "to combine support for the generation of livelihoods with institutional reform to reduce vulnerability to risk".

'Spatialising livelihoods'

Murray (2002) explains that livelihood patterns and changes in one social class are linked to livelihood trajectories in other social classes. Thus in order to understand livelihoods and vulnerabilities comprehensively it is necessary to study the livelihoods of poor and marginalised people in relation to the livelihoods of better-off people (and vice versa) (Murray, 2002; Francis, 2002). According to Murray (2002), such an approach facilitates an understanding of livelihoods and vulnerability in structural or relational terms and a necessary emphasis on power inequalities and social relations that influence the divergent livelihood trajectories of the poor and better off. The overarching PE framework supports such a relational approach and is advanced in this study through empirical investigations of socio-economically diverse households and neighbourhoods. Addressing the geography of differentiated livelihoods (i.e. 'spatialising' livelihoods) helps to theorise the community as a spatial and social network where households are dynamic entities characterised by flows of activity and exchange across spatial and temporal scales, not static, spatially and temporally bounded units (King, 2011).[19]

Moreover, understanding the spatial distribution of environmental and social threats and risks is central to a comprehensive understanding of livelihood production. Environmental risks are always unequally spatially and socially distributed and this distribution is bound up with class, race, income and power relations. Such injustices are predominantly rooted in governance and institutional arrangements. Thus, spatialising livelihoods also brings social and environmental justice concerns to the fore, because, in essence, environmental justice refers to the fair spatial distribution of environmental 'goods' and 'bads' to humans (Low and Gleeson, 1998; Scott and Oelofse, 2005).

In sum, livelihoods straddle natural/biophysical and artificial (e.g. municipal demarcations) boundaries and are produced and reproduced through complex intersections between space, power, culture, history and the biophysical environment. These are all central considerations to understanding livelihood production and

[19] This approach "assists in keeping the household as an object of analysis while addressing the critique that it is often presented as temporally and spatially fixed", and limited to the micro-scale (King, 2011: 310).

livelihood vulnerability in the context of GEC threats and associated adaptation attempts.

As alluded to throughout this Chapter, a central argument of this thesis is that culture (particularly cultural beliefs) is a main social characteristic that influences how and why individuals and groups engage with and are affected by GEC/CC impacts. Thus, at this juncture it is important to outline the conceptual framework framing the analysis of the role of culture in this thesis.

2.10 Culture and GEC perceptions and responses: A complex relationship

Culture has myriad spatial, physical, visual and emotional expressions. Moreover, culture is fluid, it is open to various influences, and exists and changes at different scales. Tiwari (2007: 67) cogently argues that "all cultures are living cultures" and "one needs to see culture as a continuum from the past to the present, and its transformation into some new form in the future is to be taken as a natural process". Therefore, as processes, cultures are likely transform and take on new forms in the future, increasingly shaped by the need to build resilience and adapt to the effects of climate change.

Notions of culture are, however, deeply complex and contested and there is no universal definition of culture (Mitchell, 1995). This thesis is guided by the following definition: "culture comprises the material products, patterns of social relations, and structures of feelings produced by multiple actors, who are differentially positioned in power relations, political economies, and social reproduction" (Radcliffe, 2006: 16). Understanding culture in this way recognises the contested nature of culture and its attributes, coproduced in dynamic ways by different actors within and between generations (Radcliffe, 2006).

Interpretations and responses to GEC/CC are rooted in social processes and cultural interests (Boyd et al, 2009). Despite being hitherto undervalued in many GEC/CC studies, perhaps due to its sensitive nature, difficulties in defining culture and the challenge of relating cultural influences to risk and vulnerability, culture is increasingly recognised as a key characteristic influencing CC adaptation (e.g. Rao and Walton, 2004; Ensor and Berger, 2009a and b; Schipper, 2009; Heyd, 2010; Kuruppu and

Liverman, 2011). Nevertheless, there is still a dearth of studies that explore empirically and theorise the relationship between culture and GEC understandings and responses. This thesis attempts to address this gap.

Theorising and interpreting culture and cultural influences is complex and can be approached in diverse ways. Culture is multifaceted and bound up with the production and reproduction of power and ideology. Norgaard (2011: 7) argues that one of Gramsci's (1971) principal contributions to social theory is his "emphasis on how social control is enacted through acceptance of ideas that prevent social change and on the important role of culture in legitimating those ideas". Conversely, new ideas can also be a catalyst for social change (including change in perceptions, attitudes and actions) – both positive and negative. Thus, culture influences our ideas about the world around us and, in turn, the direction of social change. Similarly to Norgaard's (2011) study, which addresses cultural and emotional issues in relation to CC in 'Bygaby'[20], Norway, I primarily draw on Swidler's (1986) seminal framework on 'cultural toolkits' for understanding the causal role of culture in social action and other central cultural considerations for this thesis. Building on this I draw on insights from diverse literary sources to help make sense of the relation between culture, and interpretations and responses to GEC.

2.10.1 Cultural toolkits and frameworks: theorising the influence of culture on perceptions and actions

Dissatisfied with traditional cultural theory, Swidler (*ibid*) is concerned with developing more sophisticated theoretical ways of understanding how culture shapes or constrains action and how culture interacts with social structure. In doing so, Swidler (*ibid*: 273) proposes convincingly that "culture influences action not by providing the ultimate values towards which action is oriented, but by shaping a repertoire or 'toolkit' of habits, skills, and styles" that influences our actions. Hence, culture influences social action by providing "chunks of culture" (*ibid:* 283) that can be applied by individuals and communities to construct approaches and plans of action. This is not to undermine the significance of values; values *are* core components of culture, but I do not perceive them as the overarching casual element of actions.

[20] 'Bygaby' is a pseudonym for a town in Norway used by Norgaard (2011) in her study to maintain anonymity.

The 'toolkit' metaphor signifies that culture is not a united system that leads our actions down a consistent path. Rather, as with mechanical toolkits, cultural toolkits or frameworks are comprised of several different, often somewhat messy and disorganised components, each with differing purposes, drawn on in specific circumstances for particular purposes.[21] Thus "cultures contain diverse, often conflicting symbols, rituals, stories, and guides to action" (*ibid*: 277). People draw on these diverse components in various arrangements to explain and address different problems. Swidler's (*ibid*) theory thus helps to explain how people hold multiple realities and conflicting views in making sense of GEC and negotiating the day-to-day realities they face. These views are constructed through cultural lenses and through the diverse ways in which people learn about the world around them such as through formal schooling, media and folklore. Building on this, Swidler (*ibid*: 283) explains that, "publicly available meanings facilitate certain patterns of action, making them readily available, while discouraging others". This is one way in which government and other institutions can strongly influence public perceptions and responses to GEC/CC, through applying their power to mediate and institutionalise certain viewpoints and discourses while precluding others via research, media and other sources.

Understanding the influence of the diverse components contained in our cultural toolkits in this way helps to develop a sophisticated understanding of the diverse and complex role of culture in influencing perceptions and actions in relation to GEC/CC. For Swidler (*ibid*: 277), "The revised imagery – culture as a toolkit for constructing "strategies of action", rather than as a switchman directing an engine propelled by interests – turns our attention toward different causal issues" than traditional cultural theory perspectives. Importantly, my understanding also emphasises the dynamic interaction between cultural toolkits and the constraints and opportunities provided by broader structural frameworks and that cultural influences on actions are mediated by power relations and socio-historical influences (Heyd, 2010).

Resonating with Swidler's theory, Heyd's (2010) (see also Heyd and Brooks, 2009) work on 'cultural frameworks' provides a useful framing lens to examine the

[21] If interpreted literally, the use of the term 'toolkit' may seem somewhat reifying. However, its application is meant to signify a metaphorical conceptual repertoire or frame, which encompasses multiple sub-framings. Hence, my use of quotation marks when applying the term.

relationship between culture and GEC. Heyd (2010) explains that cultural frameworks (defined similarly to Swidler's cultural toolkit)[22] are one of the key distinguishing factors between populations in terms of their combined abilities to cope with or adapt to climate variability, extremes and change. The main reason for this is that cultural frameworks influence people's interpretations of and responses to environmental phenomena (broadly encompassing GEC/CC). He argues that the conceptual framing of environmental phenomena and the development of citizen-led participatory governance are two key areas in which cultural dimensions play a central role in approaching GEC/CC. In sum, both Swidler's (1986) and Heyd's (2010) theoretical approaches offer useful insights for understanding how people draw on their cultural frameworks to conceptualise and respond to environmental phenomena, which, in turn, influences behavioural patterns and adaptive capacities to GEC/CC.

The complex relationship between culture and GEC can be viewed as bi-directional because culture shapes understandings and actions relating to GEC and at the same time culture can be influenced by GEC. Culture can provide resources for constructing strategies of action and can play an enabling or disabling role in adaptation or maladaptation and these aspects need to be better understood. "Culture evolved alongside society's ability to live with change in the past, and thus remains central in living with change in the future" (Coulthard, 2009: 264). This will be exemplified in Chapter 7.

On a cautionary note, people are not 'cultural dopes' (Swidler, 1986) and often actively draw on culture in skilled ways for various ends, sometimes for personal gains at the expense of others. This said, cultural values and beliefs are also subject to exploitation. For example, external agencies might take advantage of cultural attributes to impose pre-defined projects and objectives in an oppressive manner that may be in conflict with local priorities (Simon, 2006a).

2.10.2 Cultural resources: participatory governance and institutional cultures

The pervasive and historically entrenched belief that culture can be separated from, and analysed as if it were independent of, other human dimensions of CC and from nature

[22] Heyd (2010: 89) defines cultural frameworks as an "ensemble of beliefs, values, priorities, practices, and material support that characterise particular patterns of human thought, attitudes and behaviour".

more broadly, is a potentially disabling cultural construction (Proctor, 1998). The supposed nature/culture divide, rooted in the Enlightenment period, has considerable implications for sustainable development, vulnerability and adaptation to GEC/CC (Proctor, 1998, Bankoff, 2004a). According to Heyd and Brooks (2009) decentralised and participatory approaches to governance are cultural resources that can assist in creating awareness about nature/culture interrelationships and internalising human-environment/nature/culture interactions into policy and decision-making.

The SA context, characterised by mandated co-operative and decentralised governance is well placed to take advantage of this cultural resource. Nevertheless certain crucial preconditions and considerations are required and certain factors work against manifestation into a cultural resource. A principle precondition is genuine involvement and influence of citizens in influencing decision-makers to implement approaches that account for such nature/culture interdependencies. Building on the above theoretical conceptualisations, the following section develops a multi-level governance framework to frame empirical analyses of horizontal and vertical governance dynamics that follow in the proceeding chapters.

2.11 Multi-scalar GEC/CC governance: a decision-centred analytical approach

Adaptation to GEC is multi-dimensional and multi-scalar, encompassing a multitude of actors, sectors and governance levels. Integration across these governance levels and between different stakeholders is necessary for effectively tackling GEC (Koch et al, 2007; Bulkeley and Newell, 2010). In essence, local level adaptive capacities and adaptation measures are not formed within an institutional vacuum. Rather, they are influenced by (and influence) broader institutional and governance arrangements. I propose that a multi-level governance framework, together with Moser's (2009) decision-centred diagnostic approach (see Figure 2) provide useful insights for understanding cross-scale collaborative governance. Collaborative multi-level governance between national, regional and local government institutions is now widely documented as being central to effective and sustainable adaptation of GEC/CC, rather than initial predominant foci on international relations (Bulkeley and Betsill, 2003; Amundsden et al, 2010; Bulkeley and Newell, 2010; Corfee-Morlot et al, 2011; Heinrichs et al, 2011).

The notion of multi-level governance, as applied in this thesis "captures both the multiple levels at which governance takes place, and the myriad actors and institutions that act simultaneously across these levels" (Bulkeley and Betsill, 2003: 29). The use of the term 'governance' as opposed to 'government' has proliferated, particularly in the social sciences, as a way of explaining the changing nature of the state and the multiple stakeholders involved in decision-making and governing societies (Adger and Jordan, 2009). Whilst recognising that the notion of governance is widely debated, I apply Moser's (2009: 315) definition of governance underpinning her decision-centred diagnostic approach to decision-making: "the set of decisions, actors, processes, institutional structures and mechanisms, including the division of authority and underlying norms involved in determining a course of action".

According to Moser (2009), there are two key implications of this definition (depicted in Figure 2). First, and resonating with Bulkeley and Betsill's (2003) conceptualisation above, governance incorporates all actors involved in decision-making and is not restricted to institutions and public sector actors. Secondly, "governance is constantly held in the dialectic tension between structure and agency" (Moser, 2009: 315) (see Section 2.4.1). To mobilise this, decision-makers, "active agents embedded in particularly institutional, normative, and political contexts" are placed at the core of governance (see Figure 2 below) (Moser, 2009: 315). This brings into focus the dynamic interchanges between decision-makers, the nature (e.g. participatory or democratic extent) of actual decision-making processes and other interconnected factors impinging on stakeholders and decisions.

Figure 2: Moser's 2009 Decision-centred diagnostic approach to adaptation decision-making

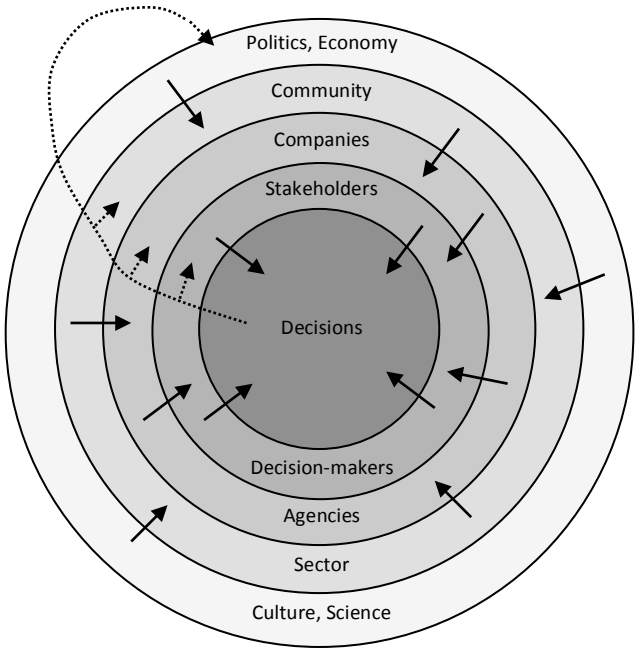

Figure 2 captures Moser's decision-centred analytical approach, which I apply under a multi-level governance framework.[23] As evident in the figure, the overarching encompassing sphere of influence on decisions comprises the values and beliefs that are embedded in and revealed in our culture (including religion), science, politics and the economy. These outermost influences define the communities and sectors in which adaptation is contemplated and addressed. In turn, this influences the range of organisations and institutions (public and private) that bring together diverse stakeholders to determine adaptation decisions and measures (Moser, 2009). This confluence of influences has either a constrictive or facilitatory (enabling) effect on governance decisions, which shape future contextual conditions.

In short, the decision-centred analytical approach facilitates an investigation of governance dynamics as facilitator or constraint to adaptation through identifying the target space (location, community, municipal area, sector, industry) under consideration for adaptation and potential adaptation decisions that may be made (Moser, 2009). According to Moser (2009: 317), "beginning with the decision-maker (s) provides a

[23] To clarify, this study's emphasis on multi-scale networked governance does not imply a decline in state responsibility, but instead highlights the need to consider the multitude of additional actors engaged in governing GEC/CC beyond the nation state.

revealing diagnostic entry point into the structural governance context….that channels adaptation planning and implementation". Under a multi-level governance framework it is important to consider at which level (e.g. local, provincial, national) decision-makers are situated, what their sphere of influence is and through which mechanisms, as well as how multi-level decisions are linked.

2.11.1 A co-operative multi-level governance framework for tackling GEC in the South African context

Predominantly rooted in studies of supra national institutions such as the European Union (EU), there is a growing body of literature on multi-level or multi-scalar governance that emphasises interpenetration and connectivity between different levels of government, particularly regarding multi-scale and cross-cutting environmental issues such as CC (Leach et al, 2007). Leach et al (2007) explain that critics argue the term 'multi-level' is gratuitous since governance perspectives should already encourage sensitivity to interrelations beyond the nation state and between different government spheres and non-governmental institutions. Nevertheless, the term 'multi-level' retains central significance in this thesis, particularly in light of its emphasis on the interconnected constraining or facilitative effects that each governance level has on the other for decision-making and action – crucial for GEC adaptation.

Furthermore, Koch et al (2007: 1331) explain that, "Climate change poses a significant challenge to the conventional analysis of institutions since traditional views of environmental governance are fundamentally hierarchical and climate change involves processes and institutions operating at a variety of scales". Existing literature notwithstanding, multi-level governance requires further research and deeper consideration, since historically and currently, meaningful and sustained cross-scale governance is lacking. Furthermore, there has been limited research on multi-level governance of CC, with a particular emphasis on adaptation and the unique role that urban governments have to play presented within a holistic framework (Koch et al, 2007; Corfee-Morlot et al, 2011). Building on this, as already highlighted, this research emphasises the unique role that collaboration between adjoining municipalities and their constituent decision-makers play in GEC adaptation and encouraging multi-scale

governance. This can be approached through a framework of understanding municipalities as linked systems.

Drawing on urban geography insights and the systems approach to urban governance, Ernstson et al (2010) explain that urban phenomena can be understood as occurring in a 'system of cities' where intricate connections between multiple entities (e.g. trade, migration) support the flow of information, energy and matter through the cities in the system. Therefore, "cities need to be viewed as loci in multiple networks of relationships at different scales, rather than as entities" (Ernstson et al, 2010: 537). This argument is applicable to interconnected rural and urban networks across municipal regions. As such, municipalities across provinces and countries stand to benefit from positioning themselves as part of a 'system' of municipalities where interdependencies and cross-scale linkages between social, ecological and technical arrangements that join municipalities are reconsidered and principally inform governance dynamics. This conceptualisation is developed in Chapter 6, based on my empirical research findings.

Collaboration between government, non-governmental networks and civil society and local stakeholders is extensively emphasised as a key requirement for appropriate adaptation that accounts for the needs and priorities of local people. Nevertheless, as exemplified in Chapters 5-8, in the SA context (as in many other contexts) CC and broader developmental and environmental issues have been hitherto addressed through a predominantly hierarchical form of governance, despite legislated requirements for co-operation between all government spheres and the broader public. Hence there is a considerable disjuncture between policy rhetoric and institutional practice with regard to multi-level governance in the SA context, which this thesis aims to further explore and explain.

Issues of co-ordination, responsibility, capacity and accountability are central concerns raised in multi-level governance literature. In a multi-level governance context, decision-making and actions at different levels of government are interlinked and interdependent with each level, influencing enabling or constraining conditions at other levels (Bulkeley and Newell, 2010). Corfee-Morlot (2011: 176) explain that a multi-level governance framework, "focuses on collective decision-making processes although it recognizes the influence of individual values and perceptions on these and

the importance of values, culture and local context in decisions about how to respond to climate change". In light of this comment and in recognition of their dynamic cross- and multi-scale potential PE, and the decision-centred governance approach described above offer useful analytical tools for investigating multi-scalar governance dynamics. Section 2.7 outlined PE theory in depth, however several relevant aspects are worth re-emphasising here. Crucial for multi-level governance, PE analysis is concerned with identifying a chain of explanation through interconnected scales or levels (Robbins, 2004). Additionally, PE's opposition to apolitical understandings and explanations of environmental change, together with its explicit emphasis on power in framing our understandings of environmental phenomena, and determining dominant explanations of such phenomena are central to understanding the dynamics of multi-level governance.

2.11.2 Deliberative exchanges in multi-level governance

Corfee-Morlot et al (2011:177) support the need for a "deliberative-analytical exchange" under multi-level governance that aims to link various stakeholders in decision-making and, similarly to Heyd and Brooks (2009), propose that local authorities are well placed to build a 'policy space' for such exchange. Deliberative governance advocates "practice-orientated sense-making of complex policy problems" (Leach et al, 2007: 31). Further, deliberative approaches to governance emphasise core features such as interdependencies and interconnections between stakeholders and actions, dynamism, openness and fluidity in decision-making, as well as the importance of everyday practices and experiences (Hajer and Wagenaar, 2003; Leach et al, 2007).

In theory, deliberative governance opens up opportunities for the voices and perceptions of marginalised and vulnerable people to be included in GEC decision-making yet, in practice, it faces many obstacles. Deliberative governance is marked by the condition of 'multisignification' which refers to the participation in decision and policy-making of a diverse range of stakeholder groups who subscribe to various often competing discourses and who perceive environmental issues in different ways (Hajer and Versteeg, 2005). Often, despite concurrent processes of decentralisation and participation the perceptions and priorities of marginalised people are excluded from institutionalised deliberative practice and policies. Thus, Foucaldian (1981) insights into knowledge/power relations and the role of power in determining dominant framings and

perceptions in deliberative governance procedures are useful for deepening the democratic content of governance and fostering effective multi-level governance. In navigating alternative pathways, stakeholders "will always have to negotiate power relations and the historical and political trajectories of existing governance arrangements, and the influence these have over the possibilities and scope of both citizen and elite action" (Leach, 2008:1793). Attention to these key influential factors, particularly the deeply politicised power relationships influencing governance processes is thus key.

The way in which deliberative governance is applied in this thesis does not imply that consensus needs to, or indeed can, be reached and that through deliberation multiple parties can reach a common understanding over different issues. There is much at stake with GEC and society is comprised of many stakeholders with divergent views of what is at stake, how and why to address CC and what to prioritise. Conflict, power plays and disagreement will always persist in politics and decision-making. These are key constitutive ingredients of politics (Gleeson and Low, 2001). Viewed in a positive light conflict and disagreement can help push policy boundaries and encourage progress and transformation. In support of this view, Aylett (2010: 479) argues that, "conflict is not only unavoidable, but also a legitimate and potentially beneficial form of participation".

2.11.3 Institutional dynamics, culture and embedded approaches

As alluded to, deliberative governance needs to be considered in relation to existing, often deeply entrenched institutional structures and linked cultures, assumptions and practices. The condition of 'institutional ambiguity' is especially relevant to the SA context where extensive legal and institutional transformation has fundamentally altered policy-making spheres (Oelofse et al, 2006). According to Hajer and Wagenaar (2003), institutional ambiguity can, however, also serve as an opportunity to open up spaces of deliberation, such as in the case of addressing GEC where roles, responsibilities and policy approaches are still being defined. This requires existing institutional cultures to be open to transformation and adaptive and flexible to deal with unprecedented challenges posed by GEC/CC (i.e. adaptive governance is required). However, several authors (e.g. Aylett, 2009; Brockhaus and Kambire, 2009; Moser, 2009; Finan and Nelson, 2009) caution that established institutional cultures and patterns can be highly resistant to change due, amongst many other factors, to structural impediments,

diversity of values and perceptions held by institutional actors and inadequate communication structures. Chapters 7 and 8 bring these and other issues to light through the investigation of my empirical research findings.

Multi-level governance of GEC/CC is a deeply politicised and highly complex process, characterised by messiness, and what Hulme (2009: 309-17) describes as clumsiness. Leck and Simon (2011) discern five key complementary reasons for this. First, addressing GEC through different jurisdictions (both horizontally and vertically) is complicated by different capacities in terms of personnel and resources. Second, as iterated in Section 2.7.1, GEC/CC can be perceived and framed in very different ways, leading to divergent implications for policy and practice. Third, the diversity of polities means that causes, severity and urgency of addressing GEC/CC and how best to achieve this are interpreted in a multitude of often conflicting ways. Fourth, different governance institutions are likely to have different priorities, policies and agendas. Situational variables such as predominantly urban, rural, peri-urban or coastal versus inland locations and populations, social diversity and wealth distribution among residents are all influential factors driving priorities and policies. Lastly, increased mobility, trade and linked transformations of environmental resources characteristic of the globalized world pose increasingly complex challenges to co-ordination of policies and enforcement among often inflexible and static political bodies.

Despite this messiness or 'clumsiness' characterising GEC/CC governance, multi-level governance remains essential. I suggest that PE, combined with insights from the decision-centred analytic approach described above, provides a useful lens for unlocking such governance dilemmas and helping to explain stakeholder strategies and decision-making processes.

While factors that shape local capacity to act on GEC/CC (e.g. resources, expertise, political commitment) are now quite well documented − particularly in Northern contexts − there is still inadequate understandings of, *inter alia,* local level roles in multi-level governance, how local government can influence and engage with higher spheres of governance and constraints and barriers to horizontal municipal collaboration. These are key issues that this thesis addresses. To achieve this, both vertical/hierarchical relationships between local, provincial and national government

levels and horizontal governance dynamics between and within municipalities and other non-governmental bodies are considered. A core justification for this approach is that effective urban and rural governance in the context of GEC requires genuine collaboration and co-operation between multiple scales of governance, especially in terms of shared infrastructure and SES functioning. Adger (2003: 186) contends that, "The nature of the relationship between individuals and agents of government in handling risk is a fraught but under-researched area". This research contributes to this under-researched area through careful analyses of such politicised and power-laden relationships in the context of GEC adaptation decision-making.

With the theoretical underpinnings to my thesis now in place, Chapter 3 provides important background information into the international and domestic SA framing context for addressing GEC/CC.

Chapter 3: Background to the international and domestic framing context for GEC/CC adaptation in South Africa

3.1 Introduction

In order to gain a holistic understanding of local level (both municipal and local community) understandings and responses to climate variability and change, it is important to understand the broader legislative, institutional, politico-economic and developmental framing context within which such finer scales are embedded. In this light, this chapter provides essential background and contextual information to facilitate analysis and discussions in the remainder of the thesis. A brief synopsis of the international CC agenda is presented, followed by a summary of CC implications for SA, which provides the basis for proceeding discussions on emerging SA CC policy. Sections 3.4–3.7 chart a critical discussion of the prevailing SA economic and development context and considers the implications thereof for addressing CC. With this macro-level understanding in place, Section 3.8 discusses post-apartheid transformations in local government and their jurisdictions, noting prominent challenges at this level, particularly the complex task of meeting concurrent developmental and environmental mandates.[24] The chapter concludes with an analysis of challenges to co-operative and multi-scale governance in the SA context.

3.2 Brief history of the international climate change context

The evolution of the international GEC/CC agenda and negotiations are well documented (e.g. Bodansky, 1993; Munasinghe and Swart, 2005; Pittock, 2009). While an in-depth review of this literature is not within the scope of this thesis, various key milestones and issues are worth noting, because the international CC context frames policy and practice at finer scales. While not of the same high profile accorded since the late 1980s, research into anthropogenic CC has a long history. Our understanding of the greenhouse effect (the process through which GHGs, predominantly carbon dioxide CO_2, nitrous oxide N_2O and methane Ch_4, trap and regulate the amount of energy in the earths atmospheric system) can be traced to the French scientist Jean-Baptiste Joseph Fourier, who discovered the phenomenon in the early 19th century (Giddens, 2009).

[24] Mandate is a commonly used term in the SA context, which refers to legal duties and responsibilities, particularly in reference to the local government level.

While the naturally occurring greenhouse effect is essential for regulating the Earth's temperature at an appropriate level to sustain human and other life, human activities that produce additional GHGs (e.g. fossil fuel burning) have caused an enhanced greenhouse effect. This has resulted in heating of the atmosphere above natural fluctuations (Pittock, 2009). In this thesis, analysis of adaptation and mitigation is concerned with this *enhanced* greenhouse effect; the overarching cause of GEC/CC.

Since its establishment in 1998 by the World Meteorological Organization (WMO) in the UN Environmental Programme (UNEP) − in response to widespread rising concern about anthropogenic GEC/CC − the IPCC has been the most authoritative body researching and documenting CC and its regionally differentiated implications. To date, the IPCC has produced four substantive reports (1990, 1995, 2001 and 2007), which incorporate both social and natural science studies.[25] These reports cover various CC aspects including causes, likely impacts (e.g. increased rainfall variability and sea level rise), as well as mitigation and adaptation measures. In the most recent IPCC AR4 report (2007), warming of the climate system is deemed 'unequivocal'. The report states that there is a 90% probability that observed warming can be attributed to human induced GHG into the atmosphere through fossil fuel consumption, land use change and agriculture (IPCC, 2007). Together, the IPCC and the UNFCCC comprise the major international responses to CC (Pielke, 2009).

The UNFCCC was signed at the Earth Summit in Rio in 1992. This marked a major turning point for the international CC agenda because the convention provides the basis for international negotiations and efforts to mitigate CC (Munasinghe and Swart, 2005). Over 189 countries, including SA have since signed the convention. The Kyoto Protocol, drafted under the UNFCCC in 1997 and enforced from 2005, is the initial pivotal international agreement to reduce GHGs. The protocol, ratified by over 168 nations, recognises that industrialised nations are largely responsible for historical and current GHG emissions and that developing nations are likely to suffer disproportionately from adverse CC impacts and have insufficient resources to support adaptation (UNFCCC, 2011). These disparities in responsibility and vulnerability underpin the complicated 'North-South politics' of CC governance and highlight CC as

[25] Its accreditation notwithstanding, the IPCC straddles the uneasy interface between science, politics and public scrutiny and, as with all research, must be understood as partial and contested (e.g. Giddens, 2009; Bulkeley and Newell, 2010).

principally a justice and equity issue (Adger et al, 2009; Pelling, 2011). The politics of North-South CC relations are a microcosm of broader historical and current unequal development and relationships between developed and developing nations. Disputes over this unequal and tense relationship have thwarted global agreements on CC and other environmental agreements (Bulkeley and Newell, 2010). With high per capita GHG emissions comparable to many developed nations, SA occupies an ambiguous position in the North-South debates, as both "climate change victim and perpetrator" (ASSAf, 2011: 63).

Under the Protocol, developed or industrialised countries (41 'Annex 1' countries) are required to decrease carbon emissions by 2012 to below average 1990 levels and 'developing' nations (including SA) are not required to meet binding reduction targets by 2012, but are required to maintain national GHG inventories (Pittock, 2009). The Protocol also established 'flexible mechanisms' for GHG emissions trading, of which the Clean Development Mechanism (CDM) has become increasingly prominent. This contentious market mechanism provides for emission-reduction projects in developing countries to acquire 'certified emission reduction' credits, which can then be traded or sold (mostly to developed nations) (UN-HABITAT, 2011).[26]

As the Protocol approaches the end of its target period in 2012, developed and developing countries' emissions inventories reveal that GHG emissions are still on the rise (WDR, 2010). Tellingly, SA's emissions escalated 18% between 1990 and 2000 (Bond, 2007). There is widespread concern and uncertainty as to whether the international community will reach a legally binding international agreement by the end of 2012, especially in light of limited progress and weak commitments by heads of state at COP 15 (2009) and COP 16 (2010) (UN-HABITAT, 2011). The major impasse is that developed countries are reluctant to agree to new commitments without concurrent obligations from rising developing powers. International CC negotiations are immensely complex since CC is a highly politicised topic and there is much at stake for all countries and their citizens in developing international agreements (Bulkeley and Newell, 2010). Moreover, both mitigation and adaptation require significant political will and have been met with resistance over the years, particularly from those with

[26] Carbon trading and offsets have been open to much scrutiny and Chapter 6 addresses certain aspects of these debates in relation to empirical findings.

powerful vested interests in the status quo (Simon, 2010). Also, until recently, national and local governments, specifically in the so-called 'developing world' have tended to sideline CC issues to focus on pressing problems such as service delivery (Adger et al, 2003; Parnell et al, 2007; Winkler, 2009;).

Initially, the international CC agenda focused primarily on mitigation. However, at COP 7 in 2001, the landmark 'Marakesh Accords', which represents the first formal recognition of the need to focus on adaptation, particularly in developing countries, were agreed (Adger et al, 2009). Following COP 7 several (albeit problematic in their allocation and application) international funding sources to support adaptation have been established. The Global Environmental Facility (GEF) is the convention's main funding mechanism (Burton, 2009). Funding mechanisms include the Least Developed Countries Fund (LDCF), the Special Climate Change Fund (SCCF) and the Adaptation Fund (Schipper, 2009). However, most international funding is still directed towards mitigation efforts, despite the increasingly clear need for adaptation measures worldwide (Huq and Reid, 2009). Moreover, while adaptation has risen to prominence in CC negotiations, research and insights into collective action for CC are still primarily focused on examining national level co-operation for mitigation, rather than the complexities of how adaptation processes emerge and evolve (Adger et al, 2009).

The international CC framework summarised above provides the backdrop for the development of CC policy and strategies at finer scales. Crucially, CC action is governed by myriad other arrangements at regional, national, provincial and local scales that have proliferated over the last two decades. The discussion now turns to an overview of predicted CC implications in the SA context, before considering SA specific CC policy and strategies.

3.3 What does GEC/CC mean for South Africa?: A brief summary

Although there is considerable uncertainty regarding localised GEC/CC impacts, there is general consensus on broader trends and qualitative impacts. While societies have been long adapting to the impacts of climate and weather through a range of practices, such as disaster risk management, GEC/CC "poses novel risks often outside the range of experience" (IPCC, AR4 Ch 17, 2007: 3).

SA will be impacted by CC in a number of interdependent ways. The IPCC (AR4, 2007) estimates a global average temperature increase of between 1.1 and 6.4°C during the 21st century, which will impact sea level and weather patterns. The IPCC (AR4, 2007) predicts that Africa could be, on average, 3,4 degrees hotter by the turn of the 22nd century. SA is already experiencing an approximate half-degree average increase in temperature since 1960, with trends indicating fewer cool days and an increase in warm days (Joubert, 2008). Increases in temperature are regionally differentiated, with interiors being warmer than coastal areas due to the moderating effects of the ocean. As such, there are considerable differences between coastal and inland experiences of GEC/CC impacts (Simon, 2012). Predicted temperature increases will exacerbate extreme events such as heat waves. Furthermore, the combination of increased temperatures and rainfall variability will lead to more droughts and floods (IPCC AR4, 2007; DFID, 2004).

Droughts and floods are already frequent occurrences in the arid to semi-arid SA landscape and any increase in such extreme events will further compromise the stressed environment (Joubert, 2008). SA is situated within a drought belt and a subtropical region of high pressure and is thus a climatically sensitive and water-stressed country (DFID, 2004; NCCR White Paper, 2011). Moreover, most SA staple crops (e.g. maize) are grown in areas of marginal climatic suitability with average annual rainfall amounting to just above the world average (DFID, 2004). A reduction in annual precipitation will impact water resource availability and surface level hydrology (Walker and Schulze, 2008).[27]

Sea level rise, combined with more frequent storm surge, threatens coastal and low-lying areas with inundation and significant infrastructural damage (IPCC AR4, 2007). Sea level rise, particularly along the African east coast, could result in adaptation costs of "at least 5 to 10%" of gross domestic product (GDP) throughout the 21st century (IPCC AR4 Synthesis Report, 2007: 50). The combined CC effects of temperature increase, shifted rainfall patterns and sea level rise will compromise, *inter alia,* food security, human health, water availability, vital infrastructure, biological and animal diversity, forestry and agricultural productivity across SA (NCCR White Paper, 2011;

[27] Approximately 98% of national water resources are already overstretched and water quality is compromised by contamination from the mining and industrial sector and concentrated effluent from major cities (Madzwamuse, 2010).

Walker and Schulze, 2008). The repercussions of these impacts for SES are interconnected and will manifest in different ways at multiple temporal and spatial scales, spanning urban-rural continua.

The Southern African Millennium Ecosystem Assessment Report revealed that many southern African communities are reliant on ecosystems to meet their basic needs of food, water and shelter (CSIR, 2004). The capacity of ecosystem services is likely to be compromised by predicted CC impacts, therefore threatening the wellbeing of already vulnerable populations. The Vulnerability and Adaptation (V&A) section of the South African Country Study on Climate Change (SACSCC), undertaken in accordance with UNFCCC requirements at the end of the 1990s and early 2000, revealed the following key vulnerable sectors: agriculture (specifically maize production), biodiversity, health, water resources, rangelands, energy and mining (Kiker, 2000). According to the SACSCC, biodiversity and health sectors are likely to be the most dramatically affected. SA is a biologically diverse country, yet specialist reports for the SACSCC predict that biodiversity resources will experience 'extraordinary impacts' under forecast climatic changes, mainly due to range contractions, shifts or a combination thereof (van Jaarsveld and Chown, 2001). It is widely accepted that SA's major HIV/AIDS pandemic will intensify the effects of CC on disease prevalence since, for example under CC scenarios, the SA population at risk of contracting malaria could double and with HIV/AIDS human resistance and recovery from such a disease is compromised (van Jaarsveld and Chown, 2001).

CC impacts are entangled in a complex bidirectional relationship with additional environmental and other changes such as urbanization, land use change and resource exploitation. Moreover, the disparate manifestation of CC impacts raises profound questions about social and environmental justice, equity and human rights within and across societies and between different generations (UNDP HDR, 2008/9). Significantly, the SACSCC and other prominent SA studies have paid inadequate attention to human dimensions of GEC/CC, specifically social vulnerability and to adaptive capacities of highly differentiated human societies.

Hence, while biophysical vulnerability to CC in the SA context is well-documented (see also Hulme, 1995; Hulme et al, 2001), social vulnerability, with which this thesis is

primarily concerned, is less well understood. Social and biophysical vulnerability approaches and their theoretical underpinnings were explained in Chapter 2. It is in the context of the predicted likely implications of CC described above and scientific research based mainly on first-generation/scenario-based adaptation research, that the SA government has begun to focus on climate protection and develop CC related policy and plans. Table 2 below illuminates key aspects of the international and national legal framework framing SA's response to CC.

Table 2: National and international legal framework for South Africa's response to climate change (based on author's review of literature)

International Level	National Level	Sectoral
• United Nations Environment Programme (UNEP) • Intergovernmental Panel on Climate Change (IPCC) • United Nations Framework Convention on Climate Change (UNFCCC) (1992) • Kyoto Protocal (1997) • Global Environmental Facility (GEF) • Protocol for the Protection of the Ozone Layer (Montreal Protocol) (1989) • India-Brazil-South Africa New Delhi Summit Declaration • Copenhagen Accord (2009)	• Environment Conservation Act (Act 73 of 1989) • RSA Constitution, Act 108 of 1996: Section 24 • White paper on Environmental Management Policy (1997) • National Environmental Management Act 104 of 1998 • Marine Living Resources Act (Act 18 of 1998) • National Environmental Management Protected Areas Act (Act 57 of 2003). • National Environmental Management Biodiversity Act (Act 10 of 2004). • National Environmental Management Air Quality Act (Act 39 of 2004). • National Climate Change Response Strategy 2004 • National Framework on Sustainable Development: People-Planet-Prosperity (2008)[1] • Long Term Mitigation Scenarios (LTMS) (2008) • National Environmental Management Integrated Coastal Management Act (24 of 2008) • National Climate Change Response Policy, Initial Policy Framework, Discussion Document for the 2009 National Climate Change Response Policy development Summit (2009) • National Climate Change Adaptation Policy Framework (2010) • South Africa's Second National Communication (SNC) under the United Nations Framework Convention on Climate Change'(2010) (Final version submitted 2011) • National Climate Change Response Green Paper (2010) • National Climate Change Response White Paper(2011)	Agriculture • Conservation of Agricultural Resources Act (1993) • Water Affairs and Forestry • White Paper on a National Water Policy for South Africa 1995, • National Water Act 1998, • National Forests Act (Act 84 of 1998) Land • Development Facilitation Act (1995) • Minerals and Energy • White Paper on Energy Policy (1998) • White Paper on the Promotion of Renewable Energy and Clean Energy Development (2002) • White Paper on the Promotion of Renewable Energy and Clean Energy Development (2002) • Integrated Resource Plan (2010) Waste Management: • National Environmental Management Waste Act (59 of 2008) Disaster Management: • Disaster Management Act 57 of 2002

[1] The NFSD retains an ambiguous position, as it does not appear to be integrated or referred to in recent CC strategies and policy proposals, which illustrated fragmentation at the national level with regards to key policy formulation and implementation.

3.4 South African climate policy and actions

Following the democratic transition in 1994, SA has undergone immense legislative reform and concurrent political, institutional, social and administrative transformation (the reformed development and economic policy context is discussed further in Section 3.6). As a result of the post-1994 period of policy and legislative overhaul, environmental issues in SA are now regulated by a sophisticated framework (see Table 2) of environmental legislation that has been commended for being among the most progressive in the world (Oelofse et al, 2006). The Constitution (Act 108 of 1996) of the Republic of South Africa ('the Constitution') guides subservient legislation in SA, including environmental legislation. The environmental clause in Chapter 2, The Bill of Rights, Section 24 of the Act, enshrines equal rights to "(a) an environment that is not harmful to their health or wellbeing; and (b) to have the environment protected, for the benefit of present and future generations". Emerging CC legislation and policy are devised in accordance with these fundamental rights, which support intra- and inter-generational justice. NEMA gives effect to the Constitution's environmental clause and is the flagship environmental statute of the Department of Environmental Affairs (DEA) (Simon, 2003b; Glazewski, 2005). Moreover, both the Constitution and NEMA enshrine the principle of participatory development. The principles enshrined in NEMA are binding on all organs of the state and serve as a general framework within which environmental management at all spheres must take place.

Recently, the SA national government has made significant progress in developing a comprehensive roadmap for CC. As the host country for COP 17, this process has received increased research attention and, in conjunction with earlier research, is therefore quite well documented (e.g. Koch et al, 2007; Atteridge, 2011; Bond, 2007; Bond, 2011; ASSAf, 2011). Appendix I summarises key milestones of SA national government's CC response from 1994 and this section discusses some of these in more detail. SA has emerged as a major player in regional and international CC negotiations, often acting as a key representative for the rest of Africa in global negotiation processes.[28] Within government, roles and responsibilities for climate policy and action are still being defined and are presently overlapping and contested. The DEA is the lead

[28] However, SA's allegiance with the BASIC (Brazil, South Africa, India, China) group and role in jointly drafting the Copenhagen Accord at COP15 raised questions about SA's strategic interests and led to accusations of betrayal (Bond, 2011).

department for developing SA climate policy and for international negotiations. The DEA also oversees the National Committee on Climate Change (NCCC) founded in 1994, which brings together government and non-government stakeholders to negotiate climate policy. At the time of interviewing, eThekwini was the only local government included in NCCC meetings and negotiation updates (A1). This is probably due to their considerable experience and expertise in the CC field (see Chapter 5). The SA Treasury has also proposed various carbon taxes and the Department of Energy (DOE) is responsible for coordinating resource and energy planning processes.

To date, co-ordination between these various ministries appears to have been lacking. However, the Inter-Ministerial Committee on Climate Change (IMCCC) representing the Cabinet level, supported by the Inter-governmental Committee on Climate Change (IGCCC) at an official level, together with the establishment in 2009 of the National Planning Commission (NPC) reveal attempts at enhanced policy co-ordination. The NPC's core responsibility is to develop a strategic National Plan and long-term vision for SA that guides all spheres of government in driving development and to support collaboration across the three government spheres on cross-cutting projects that require a multifaceted approach (NPC, 2010). Some key features of SA's CC roadmap are discussed below, in a chronological order.

As a party to the UNFCCC, SA agreed to draw up national programmes for mitigation and adaptation and outline these in 'national communications' (Mukheibir and Ziervogel, 2009). SA completed its Initial National Communication (INC) in 2000, which provided the foundation for the 2004 National Climate Change Response Strategy (NCCRS) − one of the cornerstones of SA CC policy.[29] Several sectors are yet to implement their specific plans detailed in the NCRRS adequately (Winkler and Marquand, 2009). The NCCRS emphasises integration and communication between all government levels.

However, local level government considerations are largely overlooked. Moreover, local government involvement in the formulation of the NCCRS was limited (A12).[30]

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[29] The NCCRS also establishes the regulation of the UNFCCC's Clean Development Mechanism (CDM) in SA (Winkler and Marquand, 2009).

[30] DEA guided the development of the NCCRS with input from all relevant national departments and diverse stakeholders, mostly from the NCCC (DEA, 2004).

Further, in 2006, Cabinet mandated a Long-Term Mitigation Scenarios (LTMS) process. The purpose of this participatory research-based process was to outline various mitigation scenarios based on SA's emissions trajectory to guide the development of long-term national mitigation policy appropriate to the SA context (LTMS Technical Summary, 2007). The LTMS outcomes partly inform the overarching framework for SA's National Climate Change Response Policy, captured in the National Climate Change Response (NCCR) White Paper (2011). The NCCR White Paper was approved by Cabinet and released in October 2011, two months before COP 17 in Durban. It identifies the cross-cutting nature of CC that has implications for, and must be incorporated into, policy frameworks across the spectrum of government departments. The paper is progressive in many ways and represents a turning point towards legislated CC action in the country. Nevertheless, it also has several problematic features as reviewed below.

The Paper underscores that SA is "a relatively significant contributor to global climate change with significant GHG emission levels from its energy-intensive, fossil-fuel powered economy" (8). Also included are various foci and actions for SA's envisioned transition to a "climate-resilient and lower-carbon economy and society" (7). This vision is to be achieved, "through implementing a balanced approach to both climate change mitigation and adaptation responses in terms of cost -benefit, prioritisation, focus, action and resource allocation" (13). This emphasis on the twin challenge of adaptation and mitigation is important because, as with many other countries and in line with international trends, SA national government has until recently disproportionately focused on mitigation. This created a disjuncture between local and national levels since several SA municipalities (e.g. eThekwini and Cape Town) recognised the urgency of adaptation very early on and acted accordingly. However, the White Paper indicates a greater alignment in foci between government spheres. Moreover, reflecting international trends, the Paper also distinguishes that adaptation responses, "have a much stronger local context than do mitigation responses and their benefits may appear much faster and are often more tangible, such as an improvement in local environmental quality" (15).

Regarding the formation and implementation of adaptation measures, water, agriculture and commercial forestry, human health and human settlements (divided into urban, rural and coastal), biodiversity and ecosystems, and disaster risk management are identified as the priority sectors. Further, the Paper specifies that national government is developing sectoral adaptation responses and linked plans such as the 'Department of Health Strategic Plan' and the 'National Framework for Disaster Risk Management' and the importance of co-ordination between sectors in developing these is underscored. While the importance of vertical collaboration between all government spheres is emphasised, the pivotal role of inter-municipal horizontal co-ordination is somewhat absent. Although to a lesser extent than the NCCRS (2004), the White Paper still reflects a bias towards biophysical impacts of CC (aligned with first-generation adaptation research) and less substantive focus on socio-economic, cultural and other aspects that are central to uptake and implementation of CC policy. Importantly, while differential CC challenges for urban, rural and coastal settlements are exemplified, the interconnections and interdependency between these settlements are not explicitly recognised.

The NCCR White Paper's proposed mitigation measures are guided by the national LTMS and IPCC terms of reference. SA's per capita GHG emissions are three-and-a-half times the average of developing countries, while the GDP per capita lies below the world average (Winkler, 2009). These high emissions are attributable mainly to the cheap and dirty coal that fuels SA's energy intensive economy (Winkler, 2009; Mduli and Vogel, 2010). Therefore, mitigation is primarily an energy problem in the SA context (Winkler and Marquard, 2009). However, aggregate emissions figures hide the vast gaps between the rich and poor, and between race groups in terms of both responsibilities for emissions, as well as income disparities (Joubert, 2008). Hence, disaggregation of net emissions reveals the unequal nature of economic growth and the distribution of benefits associated with that growth.

Notably, the NCCR White Paper explicitly outlines the absolute amounts of CO_2 that SA is predicted to emit in the next forty years. A 'peak, plateau and decline' GHG emissions trajectory is suggested, with the proposed peak in 2025, at 614 million tons of CO_2 (equivalent) a year. This so called 'required by science' trajectory has been criticised for being under ambitious and questioned on the basis of feasibly limiting

temperature rise below two degrees if emissions peak later than 2020 (Schellnhuber, 2008). Further, although the National Environmental Management Air Quality Act (39 of 2004) enacted legally binding air population regulations, energy efficiency remains low and emissions continue to rise. Energy, industry and transport are listed as key mitigation sectors under the NCCR White Paper. Suggested short-term mitigation options include aspects such as improved energy efficiency, increased investment in renewable energy alternatives, lower-carbon public transport, carbon capture and storage technologies and afforestation. However, there is a lack of detail as to how these options will be implemented and coal-fired energy remains a major feature of short-term plans. As a caveat, the Paper explicates that SA's CC commitments and actions depend on reciprocal actions and international finance and technology. While these mechanisms are certainly important, this can also be interpreted as a scapegoat for delaying action as long as internationally negotiated mechanisms are delayed.

There are a number of other policy papers and strategies under way that have significant CC and developmental implications. For example, government has introduced a vehicle carbon emissions tax, a non-renewable electricity generation levy, a renewable energy feed-in tariff (REFIT), and a tax on incandescent light bulbs. Further, the DOE and Treasury are currently finalising the terms of an economy-wide carbon tax.

3.4.1 Disaster management in SA and challenges to environmental and climate change policy implementation

Table 2 lists various cross-cutting sectoral policy frameworks, most of which have direct relevance to CC, specifically agriculture, water and disaster management. As a prime example of critically revised post-apartheid policy, disaster management has undergone significant transformation since 1994 and is now guided by legislation and policy, hailed as being amongst the most advanced in the world (at least on paper) (Pelling and Holloway, 2006). After significant refinement and consultation, the Disaster Management Act (57 of 2002) (hereafter DMA) was finally promulgated in 2002. The formation of the DMA was also influenced by international DRR policy, as well as a series of large-scale flood and drought disasters throughout the 1990s (Pelling and Holloway, 2006).

Since enforcement in January 2003, the DMA has been introduced in different government spheres, culminating at the municipal-level in 2004. Local governments are

required to develop disaster management frameworks in accordance with the DMA and provincial level frameworks. Significantly, the revised disaster management legislation signifies a shift from traditional reactive and ad hoc disaster response to an emphasis on prevention of hazards and risk and vulnerability reduction, as well as mainstreaming DRR across sectors (B8). As such, revised disaster management legislation provides an effective policy framework for building resilience and adaptive capacity at various scales. The DMA does not specifically refer to CC, yet covers a broad range of disaster relevant climatic hazards and phenomena such as fire, drought, floods and storms.

Despite notable progress, many municipalities, including eThekwini and Ugu, have struggled to operationalise new disaster management legislation and institutionalise a proactive and integrated disaster management culture (Roberts, 2010; Carmin et al, 2011; A12; A8, A9, B3, B2). Most of the challenges facing disaster management functions in municipalities are institutional and capacity (especially financial) issues. eThekwini's disaster management function still does not occupy a strategic position within the municipality (Roberts, 2010; Carmin et al, 2011). According to several Ugu officials that I interviewed, a similar situation applies in the Ugu and ULM context. These issues are explored further in Chapters 5 and 6 in relation to key empirical findings.

In sum, despite SA's strong policy-making and scientific research capacity, together with DRR, adaptation planning and action continues to be hampered by, amongst other aspects, deficient coordination, institutional capacity, unequal power dynamics, political will and funding. Thus, while there is relatively broad agreement on the need to address CC, with supporting policies and mechanisms being established, implementation has been slow and inadequate (Winkler and Marquard, 2009). This is typical of the SA context characterised by a progressive legislative system, marred by a large 'implementation deficit' (after Hajer and Wagenaar, 2003). Pressing problems such as lack of capacity and inequity in implementation of the law prevent environmental laws and policies from being effectively implemented. Underpinning the implementation deficit, the SA context is still characterised by widespread 'institutional ambiguity' (after Hajer and Versteeg, 2005) as a result of wide-scale legal and institutional transformation that has fundamentally altered policy-making spheres and institutional structures (Oelofse et al, 2006). Moreover, supporting institutional mechanisms for implementing national level's GEC/CC visions are not yet in place.

3.5 Supporting Implementation

Tellingly, current budget allocations across all government spheres do not coincide with national level proposals and visions on CC adaptation and mitigation. For instance, the 2011 Budget Speech indicates that a meagre R800 million has been allocated for green economy initiatives over the next three years and another R2.2 billion for environmental employment over the medium term period. CC adaptation funding allocations are curiously omitted. However, in stark comparison R3.8 billion has been allocated for "maintenance of the coal haulage road network, financed from the increased levy on electricity collected from Eskom." The figures speak for themselves in revealing current priorities and the disjuncture between CC policy proposals and budget allocations. Although national environmental budget allocations have increased over the last 17 years, the DEA's budget allocation remains low in comparison to other sectors, and provincial environmental budgets are often less than 0.5% of the total provincial budget (DEA, 2009). In addition, the last three annual 'State of the Nation' presidential addresses have overlooked CC, thereby missing the opportunity to communicate the significance of CC to many SA citizens.

Supporting institutional mechanisms and resources urgently need to be introduced for SA's elaborate emerging legislative framework on CC to be implemented successfully. This is of pivotal importance at the local government level where already overextended municipalities will have to comply with new GEC/CC mandates. While the emerging CC polices and programmes form the backbone for CC action, they principally require local-level implementation (Satterthwaite et al, 2009). Municipal officials from Ugu and eThekwini highlighted similar concerns after I enquired about the benefits of mandatory CC policies. A12's[31] explanation recorded in Box 2 is representative of most responses:

[31] Chapter 4 and Appendix III provides interview coding information. HL are my initials.

Box 2: Interviewee A12's views on mandatory CC policy

HL: What are your views on mandatory climate change policy initiated at national and provincial levels?
A12 :They are of benefit, but it only helps if the money comes; that is always the problem with national government. What they do is they set very ambitious targets and we slap them on the back for that, fabulous, they make the policy, then they mandate us but don't give the money to back these mandates. So we sit with these huge, millions of Rands worth of unfunded mandates.
HL: So there can be no follow through?
A12: That's the point, and that is what I fear will happen with the climate change stuff is that we will have these bold commitments, which will be fabulous, but there will be no resources to achieve the commitments. Creating the policy and setting the targets is obviously what national government has to do. But, in fact, making that work at the local level, we've probably got 60/70% of the grunge work to do here and we don't have the money to do that.

Moreover, SA's current economic growth path and development policy framework do not seem entirely compatible with the country's GEC/CC vision (see Sections 3.7-3.8). The following section outlines this broader context within which provincial and local governments operate in and develop and implement CC plans.

3.6 Post-apartheid South Africa: A brief history and synopsis of the current situation

SA's discriminatory past and post-1994 democratic transition are well documented (e.g. Habib and Padaychee, 2000; May, 2000; Hart, 2002; Marais, 2001; 2011). Under colonial and apartheid rule, SA society was governed by a centralised, authoritarian, top-down and discriminatory regime and was characterised by pervasive racial discrimination and economic exploitation. Far-reaching changes have occurred since the advent of democracy, including extensive legislative reforms, transformed government structures and national priorities. Nevertheless, the long-standing political-economic and socio-cultural impacts of colonial and apartheid rule continue to affect the current order and "significant continuities with the past remain" (Robinson, 2008: 27).

However, attributing current development challenges solely to the apartheid system masks the contours of the current SA political-economic order, which has reproduced,

and in some cases, further entrenched inequity in many realms (Robinson, 2008; Winkler, 2009; Marais, 2011). SA is an atypical middle-income country, characterised by extensive underdevelopment and is one of the world's most unequal societies (HDR, 2007/8). Despite being economically developed and experiencing significant gains from industrial development, the social fabric is more consistent with that of developing nations, characterised by degraded living environments, social segregation and polarization. Hence, both the so-called 'first' and 'third' worlds co-exist in an uneasy relationship in SA (Atteridge, 2011). Disparities in quality of life are most pronounced between different racial groups and between urban and rural dwellers. The racially segregated spatial pattern stemming from apartheid policies (e.g. Group Areas Act of 1966) continues in the contemporary situation, with added class-based segregation, affordability being a major constraint to residential mobility (Hart, 2002; Huchzermeyer, 2004). Spatial segregation is likely to be a persistent feature of the post-apartheid space economy as historical and current processes shaped by race and income inequality are compounded by financial challenges to housing, service delivery and land availability (Robinson, 2008).

Despite progressive advancements since the demise of apartheid, the SA government and population of approximately 50 million still face a multitude of challenges, including high levels of crime and corruption, a lack of education and nutrition, massive infrastructural and housing backlogs, HIV and AIDS prevalence,[32] unemployment, poverty, and other social and environmental injustices. Significantly, infrastructural and service backlogs are experienced very differently, with the affluent sectors of society having generally superior services than poorer, marginalised populations (Winkler and Marquard, 2009).

SA has a significant rural population but, in line with international trends, the urban population is proliferating and expected to reach about 64 % by 2030 (Winkler, 2009). Notably, SA's 21 key urban areas only occupy 2% of the land yet generate approximately 70% of the national GDP (SACN, 2006). The urban-rural continuum consists of complex and intricate linkages and bidirectional relationships that need to be better recognised and fostered in the SA context to facilitate GEC/CC adaptation. There are also significant differences in the way CC impacts manifest and are experienced in

[32] An estimated 5.24 million people are living with HIV in SA (Stats SA, 2010).

cities and rural areas, specifically between coastal urban areas and rural interiors and also between coastal and inland urban areas. As further explained in Chapter 4, this research draws on both rural and urban areas in an integrated manner. As such, I attempt to address a gap in the literature because many studies focus exclusively on rural or urban areas without explicitly considering the interdependencies between these areas, particularly when in close proximity.

3.7 The South African governance landscape: development and economic policy frameworks

The prevailing development and economic policy environment strongly influences the extent to which adaptation is addressed. Post-1994 political re-opening and economic re-integration led to major economic transformations and allowed for dominant 'Northern' ideas and policy approaches to be translated to the SA context (Huchzermeyer, 2004). The SA government quickly adopted neoliberal policies to facilitate integration into the competitive global economy (Nel et al, 2003). Despite political gains in the post-apartheid period, the economic positions of newly liberated citizens have been constrained by internal structural limitations of past and present political economies (Hart, 2002; Peet, 2007).

Various successive policy frameworks have been introduced in support of key development goals (primarily addressing infrastructural backlogs and meeting basic needs) and accelerated economic growth. These are the Reconstruction and Development Programme (RDP) (ANC, 1994), the Growth, Employment and Redistribution Strategy (GEAR, 1996), the Accelerated and Shared Growth Initiative (AsgiSA, 2006), and the most recent New Growth Path (NGP, 2010). In essence, the post-apartheid government's overarching policy framework has focused on two core principles; addressing macro-economic challenges and secondly, service delivery and job creation for the majority of the population.

Shortly after coming into power the ANC launched the apparently progressive RDP, "an integrated, coherent policy framework that would carry forward the national democratic revolution" (Hart, 2002). The RDP was intended to transform the development agenda, promote socio-economic development for the poor and focus on meeting basic needs in a 'people driven manner'. However, just two years after being

elected into power, the ANC shifted its allegiance by introducing a fiscally conservative macro-economic neoliberal policy GEAR (Growth, Employment and Redistribution), which supersedes the RDP and shifts focus away from its more social democratic commitments. GEAR's overarching aim is to fuel economic growth through expanding the private sector, fostering trade and investment and improving outputs.

The results of GEAR have been mixed. While GEAR did go some way in addressing macro-economic problems it fell short in terms of reducing poverty, meeting basic needs and creating employment, which the government assumed would be facilitated through market mechanisms (Peet, 2007). However, orientation has shifted again in recent times with the government envisaging a more significant role for itself in driving development and growth through promoting a 'developmental state' orientation, described in Box 3.[33]

Box 3: South African national government's developmental state definition

The South African government outlines the role of the developmental state as follows: The developmental state should have the capacity to give leadership in the definition of a common national agenda and in mobilising all sectors of society to participate in implementing that agenda. This includes the capacity to prioritise in a strategic way, to identify which goals and initiatives have the potential to unite the nation in an effort that catalyses the rest of the national agenda. In this capacity of national leadership, which would be informed by its popular mandate, the state will need to have effective systems for interactions with all social partners (PCAS 2008: 119).

Regarding the notion of a developmental state, the SA government appears to follow the broad definition of any state that deliberately intervenes to promote growth and development. Much of the developmental state literature stems from the widely documented experiences of the East Asian economies in the post-World War II period (Chang, 2010). An important distinction is that SA's focus is on a democratic developmental state (i.e. democratic governance), whereas the East Asian emphasis was authoritarian (Edigheji, 2010).

[33] A developmental state is a contested notion with no universal model. However, it can be narrowly defined as a state that "derives political legitimacy from its record in economic development, which it tries to achieve mainly by means of selective industrial policy" (Chang, 2010: 82).

Developmental state intentions have been captured in the ANC's development policy framework, AsgiSA (2006). AsgiSA proposed a large-scale state-led infrastructure development programme and was introduced as a response to failures of other policies and to foster the inclusion into the formal economy of the bottom third of the population (Winkler, 2009). Building on AsgiSA, the NGP, launched in December 2010 is the most recent addition to the post-apartheid government's stream of development programmes and discourses. Similarly to AsgiSA, the NGP promotes a developmental state with the economic development department (EDD) as the lead agency. The NGP sets job creation as the country's core priority with a target of reducing the current 25% unemployment rate to 10% by 2020. It has received mixed reviews, with many questioning what is essentially 'new' about the NGP, because its macro-economic underpinnings do not appear to depart from that of its AsgiSA and GEAR predecessors, because it retains central neoliberal elements such as foreign direct investment (FDI), increased competitiveness and wage restraints as being purportedly central to employment creation.

3.7.1 Challenges to SA's developmental state vision and linked climate change strategies

The ANC's commitment to a developmental state[34] has proved difficult to construct as concurrent institutional transformation and enabling policies have been lacking. The feasibility of a SA developmental state (however defined) has been questioned on various grounds, including rife corruption in the public and private sectors,[35] the constraints of globalisation and financialisation imposed by domestic corporations and the persistent politico-economic power of the fossil fuel-intensive minerals-energy complex (MEC).[36] Moreover, the situation is complicated by inherent tensions of weak EM and sustainable development as the main SA developmental state policy thrusts and concurrent neoliberal policy and economic development visions.

[34] Government is a physical manifestation or element of the state and represents the political system of a nation (Marais, 2011). Reference to the state incorporates governance whereas government generally refers to a ruling body.

[35] SA is ranked 64th among 183 countries in Transparency International's 2011 Corruption Perceptions Index.

[36] This term was coined by Fine and Rustomjee (1996) and has since been widely applied as a lens to analyse and describe SA's political-economic structure.

Fine and Rustomjee's seminal book (1996) shows the intricate connections between the state's limited political trajectories and the SA economy, still largely influenced by the MEC. The MEC can be understood as "an integral partnership between state and private capital, and an equally integral connection between a core set of activities around mining and energy, straddling the public/private divide" (Fine, 2010: 174). SA is a mineral rich country with a wealth of gold, silver, platinum and coal reserves (and subsequent cheap electricity), which have attracted foreign investors and multi-national companies (MNCs) (i.e. the basis for the MEC). Developed in the 19th and 20th centuries, the MEC was entrenched in the apartheid era and it has been argued that the state's close relationship to the MEC has created a formidable political bloc that shows little sign of diminishing (Bond, 2007). Major MEC industry players (mining/metal and petroleum production) consume the bulk of the energy share, predominantly rooted in coal extraction and are thus the main point sources for SA's high GHG emissions.

Reconciling sustainable development goals with the current political-economic structure is a principal challenge facing policy-makers and the energy system is the major tension point between development objectives and CC agendas (Winkler, 2009; Winkler and Marquard, 2009). The core relationship in terms of climate policy is between Eskom (SA's parastatal and monopolistic coal-based energy supplier) and the oil-from-coal/gas operator, Sasol (one of SA's largest CO_2 emitters) (Bond, 2011). The state has vested economic interests and a close relationship with both Sasol and Eskom who are vulnerable to carbon prices and the introduction of renewable energy. Furthermore, SA's low electricity prices (mainly to major industries not households) have led to inadequate private investment in the electricity sector. Combined with the state and Eskom's failure to diversify, adequately maintain and increase capacity led to major supply shortages in 2008 with resultant cuts to all sectors of society. Fine (2010) argues that this electricity crisis illustrates the absence of a developmental state.

Edigheji (2010) argues that promotion of the green economy and linked green industries, technology and products are important ingredients to help diversify the economy and delink from the MEC; thereby assisting the shift towards a developmental state. The NCCR White Paper (2011) promotes the green economy and outlines a 'Renewable Energy Flagship Programme' aimed at scaling up renewable energy across all sectors. Moreover, the NGP emphasises the need to shift towards a green economy

and focuses on the creation of green jobs. This aspect distinguishes the NGP from its predecessors.

Nevertheless, there are still major structural constraints to the transformation of SA's political-economic trajectory to being developmental and low carbon. For instance, achieving the domestic priority of energy provision to many energy poor South Africans will lead to increased GHG emissions, at least in the short to medium-term because, regardless of government's new renewable energy and CO_2 reduction commitments, fossil fuels still presently dominate energy provision. Further, while national government recognises that "the green economy requires profound changes in energy infrastructure" (NGP, 2010: 10), contradictory actions persist. For instance, the coal-fired Medupi power station in Limpopo province was recently commissioned (with direct financial links to the government and the World Bank), with plans for Kusile coal-fired power station in Mpumulanga province well under way (Bond, 2011). Respectively, Medupi and Kusile are the world's seventh and third largest coal-fired power plants (Bond, 2011). Moreover, several political leaders have promoted nationalisation of SA mines – a strategy that would link persistent fossil fuel use with addressing inequality.

The transition to a low carbon and climatically well-adapted society is highly complex with many conflicting interests at play. While formal government policy on GEC/CC action is critical, adapting to and mitigating GEC/CC equally involve other key societal actors, including business, civil society (including NGOs and CBOs) and the broader SA public. Viewed from a multi-level governance perspective, it is important to consider the relations between these actors with vast disparities in understandings, discourses and willingness to act on GEC/CC. Although numerous formal and informal networks with active civil society arrangements are visible in SA environmental and climate policy debates, there is limited sustained formal and informal interaction between these groups, thus leading to fragmentation and limited impact (ASSAf, 2011). These issues are explored in relation to eThekwini and Ugu municipal areas in Chapter 5-8's empirical investigations. Moreover, actions and innovations at these scales are also constrained and can be undermined by the broader SA political-economic system and weak EM and sustainability modes of governance within which they are embedded (see Section 2.6).

3.8.1 Local government in the post-apartheid context

As a prerequisite to an inclusive understanding of multi-scale governance and the obstacles and opportunities encountered by local authorities, it is important to examine the broader context within which local governments function (Bulkeley and Betsill, 2003). In the following section I outline key features of local government in the SA context in relation to the broader governance context.

Local government bodies and their jurisdictions have undergone significant changes since the demise of apartheid and new governance reforms implemented in the late 1990s. For example, the Local Government Structures Act (117 of 1998) and the Local Government Systems Act (32 of 2000) have been introduced to help craft greater accountability of local government and allow citizens a stronger voice in decision-making (ASSAf, 2011).

In contrast to the traditional three-*tiered* hierarchical government structure characteristic of the apartheid era, constitutionally local, provincial and national governments are regarded as three separate, yet interrelated *spheres* in the post-apartheid context (van Donk et al, 2008). Thus, unlike many other countries, it is not simply an administrative construct and each local government has a democratically elected municipal council. Local government is closely tied to provincial and national government since these spheres regulate municipal functions (Patel and Powell, 2009). Municipal governance is comprised of a non-executive Mayor, Executive Committee, councillors and traditional leaders (see Section 3.11 for discussion on traditional leaders). Administratively, municipal managers take the lead across several functional areas or sectors, supported by deputy managers and other municipal staff (Wooldridge, 2008; Carmin et al, 2011).

As a significant and autonomous sphere, local government has been assigned multi-functional roles and responsibilities for fostering local democracy and equitable social and economic development (Pieterse et al, 2008). In addition to environmental rights, core developmental rights such as the right to housing and basic services are also enshrined in SA's Bill of Rights. Thus, municipalities have been assigned a concurrent

developmental[37] and environmental mandate (Hart, 2002). These concurrent mandates have been difficult for local government to execute, as discussed below. The White Paper on Local Government (1998) provided the foundation for a new developmental local government system and together with the framing Constitution, led to the development of a statutory framework to support the transformation of local government and supposedly facilitate local government to meet its Constitutional mandate. Three interrelated Acts comprising this statutory framework are the Local Government: Municipal Demarcation Act 27 of 1998, the Local Government: Municipal Structures Act 117 of 1998 and the Local Government: Municipal Systems Act 32 of 2000.

Post-apartheid local governance is increasingly complex and dynamic. Yet this sphere remains a significant actor, with considerable decision-making power over local policies, development decisions and resource allocations, which ultimately influence CC adaptation prospects and barriers.

3.8.2 Municipal restructuring

In the late 1990s a contentious and deeply politicised process of revised demarcation of municipal boundaries commenced under the Local Government: Municipal Demarcation Act 27 of 1998, administered by the Municipal Demarcation Board. These demarcations created six metropolitan municipalities (Cape Town, Durban, East Rand, Johannesburg, Port Elizabeth and Pretoria), and 47 district municipalities[38] which are responsible for providing support for 231 local municipalities within their jurisdiction (Frödin, 2011).

The restructuring of the local sphere was also undertaken to complement the macro-economic GEAR strategy and the developmental local government aims. An overarching aim was to achieve "a balance between financial viability (through capturing sufficient income-generating capacity within each municipal boundary) and

[37] Municipalities are viewed as critical actors in addressing inherent backlogs in access to clean water, sanitation systems and other basic services.

[38] Recently, the role and place of district municipalities in promoting developmental local government have been brought under scrutiny due to confusion, conflicts and uncertainty about their functions, as well as inadequate performance. The ANC Summit on Provincial and Local Government held in December 2010 resolved that a Presidential Commission should be appointed to revisit the future of district municipalities (LGB, 2011).

representation (by ensuring that each municipality is small enough to enable a sense of community to develop and to facilitate local participation in municipal decision-making processes)" (Parnell et al, 2002: 113). Many municipalities now have to administer much larger areas and populations with little extra financial and other support being devolved to the local level. Regarding the aim for representation (addressed in Section 3.8.3 below), local level participation in municipal decision-making remains highly contested and somewhat superficial in many cases (Oldfield, 2008).

Cynically, these boundaries appear to have been drawn up more to facilitate national level administration, control and voting processes than to achieve the above-stipulated aims. Further, local governments, particularly within characteristically rural district municipalities across the country appear to be more over-stretched than ever. Local government is operating within a decidedly spatially differentiated environment, which has deleterious effects on core aspects of post-apartheid governance, including participation, representation, housing and service delivery (von Donk and Pieterse, 2008; Robinson, 2008). In sum, the "apartheid inheritance means that post-apartheid local government effectively functions as a differentiated democracy" (Robinson, 2008: 36).

Consequently, certain (mainly urban) municipalities with strong leaders, strong resource bases and expertise are more capable of supporting their local inhabitants to deal with the effects of GEC through maintaining infrastructure and basic services, as well as initiating local adaptation plans (e.g. eThekwini and Cape Town). GEC/CC impacts together with adaptation and migratory processes do not conform to municipal boundaries, nor do vital social-ecological systems. However there is a pervasive tendency for municipalities and regions to narrowly focus within their delineated areas.

3.8.3 Integrated development planning at the local government level

Under the Municipal Systems Act (2000), all municipalities and districts are required to produce Integrated Development Plans (IDPs) to facilitate developmental local government. IDPs outline municipal budgets and strategic plans, as well as performance indicators and key priority sectors (Harrison, 2008; eThekwini IDP 2009/2010 Annual Review 3/4). IDPs are meant to align with and link to provincial and national development strategies and policies.

Resembling the British joined-up model, local governments are largely responsible for planning and development within the constraints of policy design and financial control, presided over at national levels (Frödin, 2011). This often results in a vast disjuncture between strategies outlined in IDPs and allocated budgets. Co-operative engagement of state and non-state actors in IDP formulation is strongly advocated. However, this public participation clause rests on the assumption that the public is willing to participate and transpires within the fixed and conventional government processes (Marais, 2011). A further key constraint in SA, as in many other contexts is that, "local development and governance seldom challenge the immanent patterns of development and power", therefore, although projects may reflect real needs, they do not transform the underlying patterns of (unsustainable) development (Marais, 2011: 353).

Additionally, while consultative processes around most municipal processes and IDP formulation exist, local governments have been criticised for reverting to their established formal processes of decision-making without engaging meaningfully with local citizens (Ballard et al, 2007). When asked whether she believed public inputs shape the outcome of local policies and plans a prominent eThekwini planner (A6) exclaimed:

> ….no of course not (laughing)! But we would love it to, we really would!"
> HL: What is the issue with public participation then?
> A6: There is this romance to public participation, 'lets have the public participate', you know, this idea of 'you shape your future' and I think maybe it happens in some rare cases but not often, there is apathy from both the public and government and there is the problem of coordinating diverse views as well.

3.8.4 Negotiating development ('brown') and environment ('green') agendas

Due to their integrative nature, IDPs are potential vehicles for facilitating inter-departmental collaboration, which is particularly important for cross-cutting CC initiatives. IDPs have been used as vehicles for integrating brown (developmental) and green (environmental) agenda issues and the underpinning sustainable development discourse into strategic planning (Scott et al, 2011). However, the simultaneous elevation and revision of environmental and developmental agendas from 1994 created tensions and conundrums at different government levels, particularly local government levels in seeking to balance these agendas (Freund, 2001). Roberts (2008: 253) explains, "This tension was exacerbated by the fact that environmental concerns are regarded as

being of less significance than development priorities in South Africa". Thus environmental issues have been historically understated in many municipal IDPs (Patel, 2008).[39]

Environment and development issues have a particularly tense relationship in the SA context. There is a widely held and deep-rooted (mis) perception of the environment as being antagonistic to, instead of co-dependent with, development (McDonald, 2002; Patel, 2008). While this is of course not unique to the SA context, this historically and politically embedded viewpoint is strongly linked to oppressive colonial and apartheid eras whose legacies continue to bear on current environment and GEC/CC agendas (McDonald 2002; Patel, 2008; Leck and Simon, 2011; Simon, 2011). This research points to the environment-development schism as a key barrier to adaptation and addressing environmental issues within case study communities, local and higher government spheres. The counterproductive and damaging effect of this binary discourse is thus explored in the presentation of empirical findings in Chapters 5 − 8.

3.9 The mainstreaming debate

In light of developing contexts' tendencies to prioritise pressing development goals over environmental and CC concerns, there have been increasing calls (e.g. Huq and Reid, 2009; Parnell et al, 2007; Roberts, 2008; Sharma and Tomar, 2010) to mainstream CC adaptation to support strategic immersion into existing development pathways instead of being seen as an 'add on', thus risking a sidelining effect. In SA, all government spheres increasingly support the mainstreaming approach, as evident in the NCCR White paper (2011), which promotes mainstreaming of CC across all government and non-government sectors.

While supporting the need to mainstream to ensure that GEC/CC acquires urgent attention I argue that integrating GEC/CC adaptation into the existing SA development agenda runs the risk of reproducing inequalities and injustices because these have not yet been successfully altered. Thus, in the short-term, mainstreaming will help governments to simultaneously address the equally urgent development and CC challenges, but over the medium- to long-term, the existing development agenda needs

[39] However, this situation appears to be shifting since recent RDP revisions (from about 2007 onwards) in various municipalities, such as eThekwini and Johannesburg and, to a lesser degree, in rural municipalities such as Ugu, environmental and CC issues have received increased prominence.

to be revised in order for adaptation measures to be effective in the long-term. I support Ziervogel et el's (2006: 303) contention that, "Adaptation to climate change is therefore going to be best supported through addressing direct climate-related stresses as well as strengthening existing development policies that increase livelihood resilience in the face of multiple stresses". However, as a caveat I would add *transformation* or, at least, *revision* of existing development policies rather than simply 'strengthening'. This argument is returned to and substantiated in Chapter 8 through empirically-based analysis.

3.10 Challenges to multi-level and co-operative governance in the South African context

The need for all government spheres to co-operate and collaborate is a priority emphasised in the Constitution and in NEMA. Thus, in principle, a multi-level, collaborative governance model now guides the SA context. Nevertheless SA has battled with the shift from government to governance and co-operative governance across the three interrelated government spheres and horizontally between municipalities is considerably lacking, particularly in relation to environmental issues. Co-operative governance is challenged by SA's long history of hierarchical decision-making, inadequate inter-governmental collaboration and power struggles (including, amongst others, decision-making, funding, responsibilities) between different government levels.

The Intergovernmental Relations Framework (IGR) Act 13 of 2005 was introduced to facilitate inter-governmental coordination, specifically through new forums that integrate the three government spheres (Pieterse and van Donk, 2008). This framework is also intended to enhance inter-governmental communication, which is promoted as pivotal to addressing inherent problems of policy and strategy integration between different government spheres (Berrisford and Kihato, 2008). However, inter-governmental communication structures are still lacking and ad hoc, with provincial and national government interpreting their Constitutional roles in different and sometimes contradictory ways (Patel and Powell, 2008). This often leads to incompatible interpretations of roles and responsibilities with persistent tensions between municipal and provincial planning.

There are critical implementation, institutional, communication and power dynamics embedded within local governments and vertically between other government spheres. These deep-rooted dynamics are proving difficult to understand and overcome within the dramatically transformed democratic context. Not only is vertical integration regarding development plans and institutional priorities lacking, but horizontal integration across departments in all government spheres, as well as between municipalities and provincial departments, is inadequate. Achieving horizontal and vertical collaboration and a balance between these is complicated by restrictive funding arrangements (which often compel vertical accountability and co-operation), mismatches in political clout, fragmentation and antagonism between sectoral departments and autonomy of state-owned enterprises (Pieterse and von Donk, 2008). These issues will become clearer in Chapter 6's empirical analyses in the context of addressing CC.

3.10.1 Traditional authorities and local governance structures

Furthermore, the constitutionally mandated authority of traditional governance systems has created both overlaps and disjuncture in the SA governance system, particularly at the local level (Goldman and Reynolds, 2008). Much of the country's vast rural land is still under tribal authority, which means that traditional leaders – known as chiefs or *Amakosi* (*Nkosi* for singular*)* − preside over such land and act as gatekeepers (Beall, 2005). Section 81 of the Municipal Structures Act makes provisions for traditional leaders to participate in formal proceedings of municipal councils. Furthermore, the White Paper on Traditional Leadership and Governance entrenches the key institutional role of traditional councils, in the fight against poverty and the promotion of good governance (DPLG, 2003). Despite these provisions, the roles and responsibilities between local government and traditional authorities remain ambiguous, thus leading to power disputes, tense relations and other complications (Goldman and Reynolds, 2008).

Traditional authorities have significant power over key natural and human resources as well as the direction of local development paths and livelihood opportunities (Beall, 2005). Therefore it is essential for tensions between traditional and local governance authorities to be addressed and for traditional leaders to be meaningfully involved in shaping mitigation and adaptation agendas. An important prerequisite is that chiefs support the need to address GEC/CC. However, this thesis shows that chiefs have not

been adequately involved in environmental decision-making processes in the municipal study sites and also often lack adequate information regarding the significance of GEC/CC and the likely implications for their areas. This issue is explored further in Chapter 5.

3.11 Conclusion

This chapter has charted important background and contextual information, as well as the policy and institutional framework that guides SA's development path and GEC/CC responses. This overarching framework provides the framing context within which local level municipalities and communities perceive and respond to GEC/CC. Evidently, as with many African countries GEC/CC is but one stress in a very complex environment characterised by multiple interacting challenges (Reid and Vogel, 2006; Ziervogel et al, 2006). Moreover, this chapter has indicated that policy frameworks do not necessarily translate unproblematically into actions on the ground. There are a number of interacting political, social, economic and cultural factors operating at the local level that need to be better considered in GEC/CC policy and programme formulation. The existence of pressing developmental and other priorities, together with the prevailing inequitable political economy also means GEC/CC is largely marginalised as a strategic and political priority issue.

Before presenting and analysing my empirical research findings (in Chapters 5-8), it is important to understand the way in which I went about collecting these. Therefore, the following Chapter 4 presents the methodological approach and charters the suite of methods applied to meet the research aims and objectives. Chapter 4 also provides important details about climatic, social, political and economic characteristics of eThekwini and Ugu municipalities, and my case study sites within each municipality.

Chapter 4: Methodology and contextualising the research sites

4.1 Introduction

Chapter 1 introduced the study and the overarching aim of this thesis: to investigate comparatively responses to climate variability and GEC/CC at the local government and community scales (with the household being the micro-unit of analysis) with a focus on adaptation. Chapter 2 outlined the study's theoretical underpinnings and Chapter 3 explained the broad social and political-economic context and policy environment for the empirical investigations. This chapter restates the particular focus of my research, and explains the methodological approach adopted to undertake it, before setting out the suite of methods applied to meet the research aims and objectives outlined in Chapter 1.

The study is predominantly qualitative in nature and entails detailed comparative analyses. Since the research involves extensive interaction with people, it falls broadly within the domain of social science. However, as Chapter 2 showed, numerous disciplines have contributed to understanding how societies perceive and deal with environmental change and variability. As such, this thesis is based on an interdisciplinary approach. Natural science understandings of predicted CC effects are considered in conjunction with social theories regarding vulnerability and response to risk, together with actual experiences and viewpoints of local citizens. Further, an interdisciplinary research approach opens up opportunities to draw on multiple theories and various methodologies for data collection and analysis. Mixed methods social science techniques are employed to answer the research questions. PE is the dominant framing theory for guiding the multi-scalar analysis informing this study and the research design to account for both environmental and development issues, recognising the multiple and sometimes conflicting knowledges and understandings about GEC/CC and the various discourses and viewpoints that underpin them.

In addition to important ethical considerations when undertaking people-focused research, many factors influence the research design and methodological approach. Much of the empirical research involved interacting with local citizens and asking them questions in various contexts where both the researcher and researched bring their subjective influences to the research process (Hennink et al, 2011). Therefore, as exemplified in Section 4.8.7, reflexivity and critical awareness of positionality are central to my methodological approach.

Initially this chapter characterises the broad research location, providing justifications for the choice. Next, the research design and approach are introduced, followed by comparative detailing of the two municipal study sites. The research strategy and approach for selecting local study communities/neighbourhoods are then exemplified, followed by an outline and justification of the various methods of data collection for answering each research question. A summary of data analysis procedures is then outlined, before the chapter concludes with a discussion on positionality, implications of working with a translator/research assistant, reflexivity and ethical issues.

4.2 Choosing a research location: KwaZulu-Natal (KZN) Province, South Africa (SA)

This thesis adopts a multi-stressor perspective for investigating constraints and drivers to GEC adaptation. As such, non-climatic issues such as development concerns and institutional settings are considered in conjunction with climatic stressors and predicted GEC impacts. SA provides a particularly useful context in which to undertake this type of study. Underpinning SA's environmental and climatic conditions are a complex discriminatory and inequitable political-economic and social history. These climatic and non-climatic factors converge to create webs of influence for vulnerability to GEC.

Alongside the quest to meet urgent development goals, SA society also needs to address numerous challenges to enhance adaptive capacities and respond effectively to climate variability and change. SA's experience of disasters in the form of flooding and other extreme events has influenced the current vulnerability context, which offers a useful lens for understanding future vulnerability and adaptation possibilities (Eriksen et al, 2011). Only limited empirical social science research on understandings and responses to GEC/CC has been carried out in SA, specifically in the local study sites. However, scientific and technical research on climate variability, climatic conditions and predicted GEC/CC effects are more prolific (e.g. Viljoen and Booysen, 2006; LTMS, 2007; Walker and Schulze, 2008; Lumsden et al, 2009; Winkler, 2009).

The SA province of KZN, the broad area chosen for this research (see Figure 3), represents in microcosm many of the wider SA climatic, social and political-economic trends and risks described in Chapter 3. KZN has a long history of climate variability, and is prone to extreme climatic events (CSIR, 2006; Reid and Vogel, 2006). Combined

with climatic risks, KZN, as with the other SA provinces, is currently faced with significant stresses such as widespread poverty, inequality, poor governance, inadequate infrastructure, and health problems. Hence, this combination of various climatic and non-climatic stresses characterising the region offers an effective context in which to research vulnerability and adaptation to GEC/CC. Moreover, having grown up in Amanzimtoti (a southern suburb of metropolitan Durban) within KZN, the research focus emerged, in part, from my desire to understand more fully the implications of GEC/CC for the place I call 'home'. A core justification is to help raise awareness and address the disparities in adaptive capacities and vulnerabilities between citizens in the different research areas and reveal some of the underlying causes of these disparities.

Figure 3: Map of South Africa highlighting the 9 provinces, surrounding countries and eThekwini and Ugu coastlines

Source: Adapted from Nations Online Project (1998-2011), insert map adapted from DEAT (1999)

KZN's coastal region[40] is characterised by a subtropical, humid climate. There is considerable seasonality and inter-annual variability of rainfall in KZN (Reid and Vogel, 2006). Moreover, some SA regions, including KZN, have experienced more intense rainfall events in recent decades with inter-annual variability also increasing, along with more widespread droughts, indicative of a greater correlation with ENSO and predicted CC impacts (Vogel, 2000). With the exception of the south-western Cape, SA, including KZN, experiences mostly summer rainfall. Yet, recent trends show that the country is getting drier during the summer months of December and February. KZN is thus drought and flood prone and these phenomena are expected to become more frequent and severe under projected CC scenarios (CSIR, 2006). Research undertaken by the KZN Department of Agriculture revealed that KZN is highly vulnerable to changes in the world's climate and has the highest flood hazard level in SA, with the south coast being the most exposed (KwaNaloga Discussion Document, 2010). Indeed, KZN has experienced an unusually high incidence of extreme weather events over the past few years, particularly in the case study areas.

4.3 Outline and explanation of research design and approach

The empirical research comprises two main thematic 'layers'. The first layer entails a comparative analysis of the neighbouring KZN Ugu and eThekwini coastal municipalities' responses to GEC/CC, complemented by a second layer of analysis where household level understandings and responses to GEC/CC in ten different study sites between the two municipalities (four from Ugu and six from eThekwini municipality) are examined. I now discuss each of these in turn as well as the justification for this approach.

The research follows a cross-cultural comparative design where various cases are explored using the same overarching methodological approach. Bryman (2008: 58) explains that comparative design "embodies the logic of comparison in that it implies we can understand social phenomena better when they are compared in relation to two or more meaningfully contrasting cases or situations". This definition effectively captures the logic for adopting this design. Justification for the comparative approach is provided in Chapter 1 and 2; however, it is useful to reiterate central points here. Many

[40] All the local study sites fall within the broad KZN coastal belt although certain sites such as Ngcolosi (see Table 5) are classified locally as 'inland' settlements.

CC actions, particularly adaptation, will occur at the local government scale, thus local municipalities have been assigned a major role in addressing GEC/C. However, municipalities, particularly in the inequitable SA context, have very different capacities to implement adaptation measures and support local citizens' adaptive actions. SA's six metro municipalities are generally stronger in terms of infrastructure, basic service provision and other municipal responsibilities than the forty-seven (predominantly rural) district municipalities. These disparities have been created through the historical and current inequitable political-economic order where urban areas are allocated greater funds and are able to generate greater resources than rural areas, through, for example, larger tax bases, concentrating economic activities, investment, and human capital.

Addressing these disparities and encouraging inter-municipal collaboration, especially between neighbouring municipalities, is important for joined-up CC action across municipal spaces. Such collaboration is important for SES that straddle artificial boundaries. It also important for ensuring that citizens within district municipalities are not further disadvantaged in the context of GEC/CC, simply as a result of being classified under a different jurisdiction with less capable local governments. Rural municipal spaces also occupy a large percentage of the SA landscape and contribute significant natural and human resources to metropolitan cores.

A few recent SA-based studies (e.g. Holgate, 2007; Mokwena, 2009) have undertaken comparative studies on barriers and facilitators to CC action between major cities such as Johannesburg and Cape Town (see Chapter 6). These metros face broadly similar economic and developmental challenges. The importance of these studies notwithstanding, I argue that much more needs to be known about the very different (and sometimes similar) underlying challenges that district municipalities face in comparison to urban municipalities and how these can be addressed to ensure more equitable and just CC action across municipal boundaries. Urban and rural areas have bi-directional relationships as they are connected in complex ways. Some challenges and opportunities for CC adaptation and mitigation are similar to both contexts and others more distinct and these need to be better understood. Therefore, eThekwini metropolitan municipality, which has a strong urban core, and rural Ugu district municipality, with a narrow coastal strip tax base were selected as the broad units of analysis for this study.

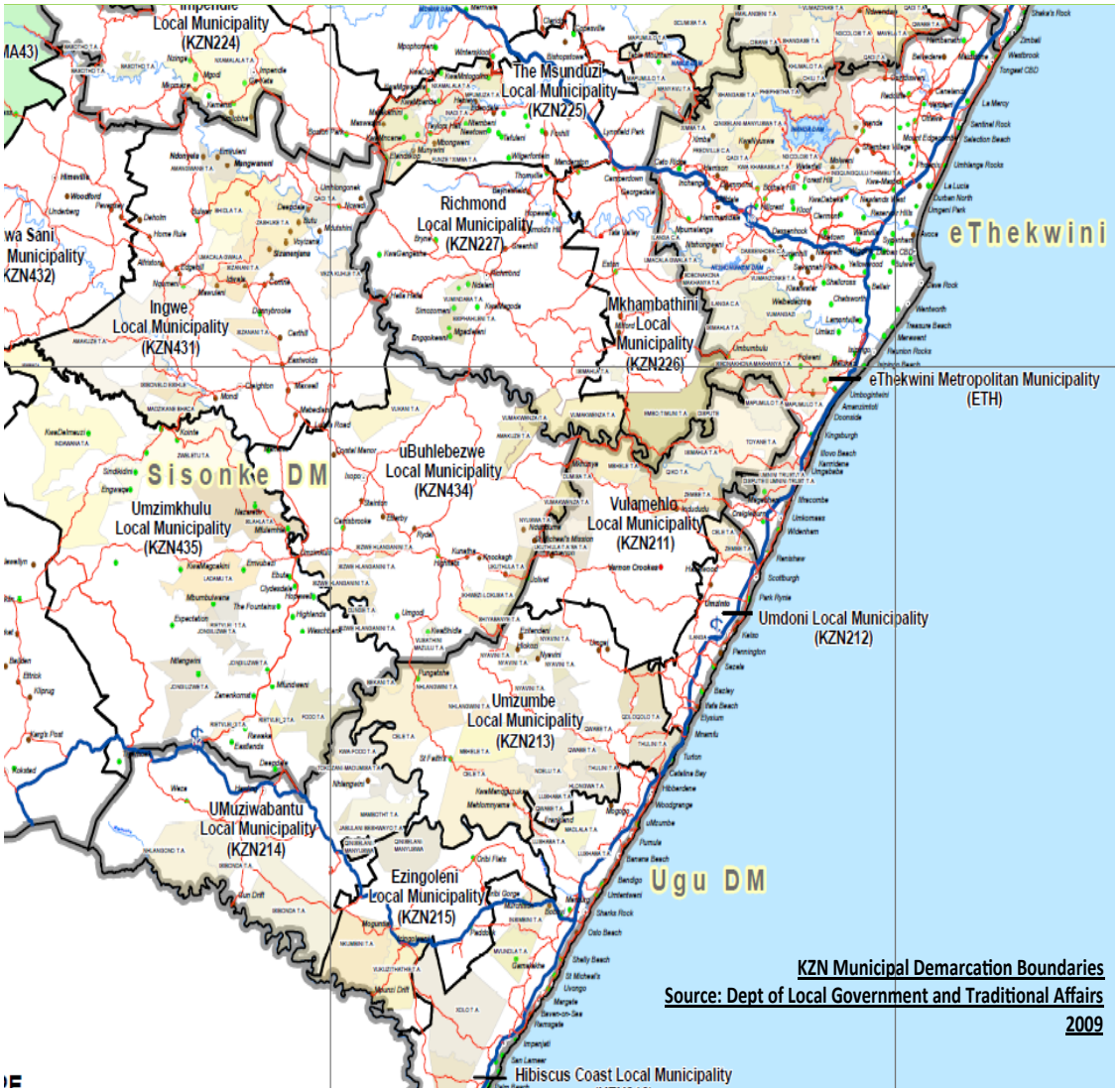
Within the growing social science based GEC/CC literature, this type of study is also unusual and important since analyses often centre on city to national scale opinion polls and surveys of collective public perceptions of CC, mostly through using quantitative data (Bulkeley, 2000; Wolf and Moser, 2011). While these studies are important, Wolf and Moser (2011) argue that more finer scale, qualitative and in-depth studies (as undertaken for this thesis) are required to elicit contextually relevant insights into individuals' experiences, understandings and engagement with CC that cannot be elicited through broad-ranging surveys. My empirical findings presented in Chapters 5-8 verify Wolf and Moser's (2011) claim that fine scale studies can create deeper insights into, amongst other factors, belief systems and behavioural responses. This helps to uncover culturally relevant framings to specific regions to construct solid bases for the design of adaptation measures.

4.4 Contextualising the municipal study sites: eThekwini and Ugu Districts

Both Ugu and eThekwini municipalities are situated along the south coast of KZN and are characterised by subtropical climates with current daily maximum temperatures ranging from 20-26°C (CSIR, 2006). eThekwini is classified as one of six SA metropolitan municipalities and is the only one in KZN with that status. Ugu, on the other hand, is classified as a district municipality and encompasses six smaller, mainly rural, municipalities within its borders[41]. Ugu is eThekwini's southern neighbour with the coastal boundary line near the Mahlongwane River close to the town of Scottburgh, extending a considerable distance inland (see Figure 4).

[41] These six local municipalities include Umdoni, Hibiscus Coast, Umzumbe, Ezingoleni, Vulamehlo, Umuziwabantu.

Figure 4: Municipal demarcation map showing eThekwini and Ugu District Municipality and its six constituent local municipalities



Durban (within eThekwini municipality) is a major SA city, which contributes significantly to the KZN and SA economy as the largest port in Africa and second largest manufacturing base in the country, after the Gauteng heartland (eThekwini IDP 2009/10 annual review). The city contributed fully 64.1% of provincial GDP in 2009 (eThekwini IDP, 2011/12). eThekwini is one of the leading SA municipalities in terms of human and financial resources (Breetzke, 2009). eThekwini has a population of approximately 3.5 million people, occupying an area of 2300km$^{2.}$.The municipal space comprises a substantial urban core and immense rural hinterland. The approximately 10% rural population occupies about 2/3 of the municipal area, with increasing urban populations occupying a much smaller and overburdened land area (A11).

Ugu district municipality spans 5866 km², almost double the area of eThekwini, while the estimated population for 2010/11 is only 756,370 (Ugu District IDP, 2007-2012). The municipality thus covers a larger area than eThekwini but has a much smaller tax base due to its smaller, predominantly rural population. Ugu, a financially under-resourced and under-skilled municipality, has large tracts of under-developed and under-serviced rural hinterlands. 84% of the district is rural with the 16% urban space (largely within Umdoni and Hibiscus local municipalities) being more densely populated, particularly in coastal zones. Ugu's economic priorities are agriculture and tourism. The district contributes, on average, only 3.3% to the KZN economy (Ugu District IDP, 2007-2012).

Both municipalities are characterised by high poverty and unemployment levels. HIV/AIDS prevalence poses formidable challenges to both municipal areas. The regions also have high socio-economic inequality, with divides still being considerably racialised, but with a new distinct class divide emerging (Breetzke, 2009). Furthermore, food insecurity and hunger are immense challenges facing marginalised communities within both municipalities (eThekwini IDP, 2011/12; Ugu District IDP, 2007-2012).

Table 3: Some key characteristics of Ugu and eThekwini municipalities

Municipal characteristic	Ugu District municipality	eThekwini District municipality
Municipal area	5866km^2	2300km^2
Estimated Population	709918 Predominantly rural: 86%	3.5 million Urban areas most densely populated, rural land area approximately 60%
Unemployment rate (excluding informal sector employment and including economically active population)	Approximately 48% (highest proportion within rural areas)	35.5% of economically active population unemployed, 21% is official unemployment rate given
Poverty Rate	55%	24.6% (lowest in KZN)
Municipal Budget 2011/12 Environmental Department Budget 2011/12[42]	Approximately 1 billion R2millon to R2,3 million	Total Budget 28.6 billion R23.5 billion operational budget R5.1 billion capital budget R2 000 000.00 Capital budget for land acquisition R30 million and R887 848.00 Operational and project based budget is R30 887 848.00
Total number of municipal employees	2138 (based on 2003 latest available statistics, therefore the 2011 total will be substantially higher but still a fraction of eThekwini's total)	997 566 (53.4% of provincial total) (2011)
Total number of environmental department employees	13 employees over 2 branches	+-26 divided over 5 branches

Sources: Stats SA, 2001; Breetzke, 2009; SACN, 2011; ASSAf, 2011; eThekwini IDP, 2011/12; Ugu District IDP, 2007-2012; B1; A1.

The socio-economic make-up and settlement patterns characterising the two municipalities are broadly similar where wealthier, well-serviced, predominantly urban coastal areas are juxtaposed with impoverished, under-serviced largely rural interiors. These stark divisions of wealth and development needs and opportunities that exist between the coast and the interior of both municipalities stem from the apartheid era marked by unequal resource allocation between majority white coastal areas and mainly African interior areas (Houghton, 2005). The fragile coastal strips of both municipalities are exposed to significant development pressures as urbanisation rates and associated demands for housing, infrastructure and services continue to climb while rural areas have many pressing developmental problems relating to, amongst other issues, service

[42] Both municipalities receive sporadic grants from state and non-state funders but due to their varying nature are not included in the budgets specified in the table. All table data is based on available sources and exact figures are constantly changing.

provision, housing and employment opportunities. Additionally, already stressed biodiversity and natural resources are threatened by development pressures and inappropriate urban development patterns. Thus both eThekwini and Ugu exhibit broadly similar economic, social, political and environmental challenges. However, as evident from Table 3, there are stark contrasts in the extent and depth of these challenges between the municipalities.

At this juncture, it is useful to explicate some of the connections between the two municipalities already alluded to in order to illustrate some key aspects of their relationship in the context of GEC adaptation. eThekwini and Ugu municipalities are separated by administrative boundaries, yet are connected through dynamic and interrelated socio-ecological systems and processes. It is inevitable that contiguous physical regions cut across multiple municipal boundaries, which are drawn according to political and other criteria rather than 'natural' functional zones. Thus ecological as well as social, economic, political and factors and functions are not always neatly contained within administrative boundaries and where overlaps occur, interdependencies and shared problems and opportunities between the contiguous municipalities are created.

Politically, administrative boundaries are subject to adjustments (usually near election periods) by the municipal demarcation board (see Section 3.8.2). Thus municipal bodies can 'inherit' new land and communities or forego existing areas, thereby creating new challenges or opportunities to existing (or absent) community-based and municipal-led adaptation measures.

Relaying concerns about municipal border restructuring, B3 from ULM explained:

> There was a rumour that we might inherit Umkomaas along with Clansthal and Cragieburn from eThekwini and there was another story that we will be getting most of Vulamehlo which is the other municipal area, which is absolutely rural, no infrastructure in place, no tax base, so that will be a big challenge for us.

Further, there are reciprocal labour and trade flows (e.g. commercial and subsistence agricultural trade such as bananas and sugarcane) and established commuting patterns for work and recreation (e.g. rural Ugu residents seeking employment in Durban city) between the municipal areas. Moreover, the municipalities share critical biodiversity

and ecosystem goods and services. For example, several catchment systems extend through both municipal areas and are thus impacted by activities in both areas. Connecting and conserving networks of open spaces, including grasslands, forests (including dunes) and water bodies across the municipal areas are important for enhancing biodiversity, ecosystems and ecological corridors in support of adaptation measures. For example, from a CC adaptation perspective, the impacts of sea level rise and storm surge along the interconnected municipal coastal corridors can be attenuated through enhancing vegetation and protecting fore dunes and ensuring that coastal developments (especially those that straddle administrative borders) are built in accordance with appropriate set back lines.

Collaboration and co-operation between the municipalities could facilitate the extension of Durban's pioneering metropolitan open space system (D'MOSS) – a protected network of open spaces (approximately 74 000 hectares)[43] of land and water (ASSAf, 2011) – beyond its boundaries to create a much larger scale network of open space (including water bodies) and natural resources to support adaptation through various functions such as flood attenuation, soil erosion control, eradication of alien invasive species and water supply (eThekwini, 2011).

Such collaboration could also enhance distribution of natural vegetation cover such as endangered endemic grasslands (e.g. KZN Sandstone Sourveld). Additionally, the municipalities share critical infrastructure such as road networks (e.g. N2 highway and R102 coastal road), rail networks, underground water pipes and storm water drainage systems.

The centrality of the above connections and interdependencies between the municipal areas can be understood through deploying a socio-ecological systems frame (see Section 2.2.1) which emphasises bi-directional relationships and the multi-scalar interconnectivity of all system components across natural (e.g. rivers and mountains) and anthropogenic (e.g. municipal demarcations, provincial borders) boundaries,

[43] As a layer that overlies the underlying town planning scheme zoning, D'MOSS has legislative authority, D'MOSS "is a controlled area wherein, despite the underlying zoning, development may not occur without having first obtained the necessary environmental authorisation or support from the Environmental Planning & Climate Protection Department of the eThekwini Municipality, which may or may not be given" (eThekwini Municipality, 2012: http://www.durban.gov.za/City_Services/development_planning_management/environmental_planning_climate_protection/Durban_Open_Space/Pages/MOSS_FAQ.aspx).

thereby supporting holistic and joined up thinking necessary for effective adaptation to CC. From a SES viewpoint Brooks (2003: 11-12) explains, "we therefore cannot view systems as closed, nor can we assess a system's ability to adapt without considering the role of obstacles to adaptation that might be determined by processes operating outside of the system in question". In sum, functional zones typically extend beyond municipal boundaries and therefore require collaboration between municipal areas for optimal functioning and for CC adaptation measures to succeed. In light of the above central points, key objectives of this research (see Table 1) are to investigate how local authorities address common problems – many of which are trans-boundary in nature – and the extent of collaboration in so doing.

As with many other places around the world, it can be argued that the regions have recently experienced the adverse effects of what an anthropogenically-altered future climate may induce. Over the past few years, extreme coastal storm surges and a series of extreme rainfall events have impacted the municipal areas, causing loss of life and devastating infrastructural and property damage which undermined development progress. Table 4 summarises the likely/expected future climate to be experienced in Durban and Ugu/ULM. These predicted climatic changes will variously affect interlinked key sectors including health, water and sanitation, biodiversity, agriculture, infrastructure, disaster management, strategic planning and economic development and coastal, as well as storm water and catchment management (CSIR, 2006; Cartwright and Constable, 2010). Appendix II summarises likely impacts of GEC/CC on these sectors and possible implications thereof for the eThekwini and Ugu regions.

Table 4: Likely/expected future climate to be experienced in Durban and Ugu/ULM

Climatic Factor	Expected Changes to Climate variable-short and long-term
Temperature	Increase in mean temperature Minimum (expected increase 3-4°C) and maximum (expected increase by 2-3°C) temperatures are increasing Heat waves with temperatures over 30°C expected to increase between March and October
Rain	Marginal increase in net annual rainfall yet change in distribution-longer dry periods and increase in short, intense rainfall events
Sea Levels	Average sea levels expected to rise by 2.5 cm every 10 years in the long-term (combined with increased intensity and frequency of storm surge)
Extreme Weather Events	Likely increase in frequency and severity of extreme and sudden events such as wind storms, storm surge and floods

Sources: CSIR (2006), Various Presentations from Durban Climate Change Summit (2009), Cartwright and Constable, 2010.

The above potential GEC/CC effects are interlinked and manifest in contexts of multiple pressures to create exacerbated effects. Thus the empirical research does not focus on a single climatic stressor or potential GEC impact such as water scarcity or flooding. The research is concerned with understanding which CC impact(s) (if any) are affecting households through participants articulating their own lived experiences and perceptions. As such, I avoided imposing any assumptions about climate-related issues and experiences in the study sites. While focusing narrowly on one climatic impact may have made the data collection process and data sets more manageable, my alternative more holistic approach was very effective, especially since the aspects that I anticipated to be most threatening and concerning often did not match the realities and perceptions expressed by participants. Furthermore, on a practical level, the fact that I sampled case studies from rural, peri-urban and urban areas, both inland and on the coast, did not lend itself to this kind of specification.

4.5 Research strategy

Following the decision to undertake research in these KZN municipalities in late 2008, I began to consider possible community-level study sites, based on my existing knowledge of the research context. However, I did not design a concrete strategy in advance of fieldwork to allow for flexibility and reflexivity and to adapt my approach in accordance with emerging issues in the field.

The research strategy involved numerous site visits: several formal and informal meetings with municipal officials were undertaken in June 2008 and May 2009 to gain an initial understanding of the current local context and research gaps. These engagements were also particularly fruitful for obtaining contact details for further key stakeholders. In May 2009 I visited proposed field sites to assess feasibility in terms of accessibility, obtaining necessary permissions and safety concerns[44] which facilitated the informed choice of final municipal sites listed in Table 5. During this visit I also attended an important climate change conference in Durban, hosted by the eThekwini municipality at which I gained important insights into existing CC measures and met useful contacts. The majority of data collection took place during the main fieldwork period (October 2009 to August 2010). I also undertook follow-up visits in December

[44] Safety is a significant concern in the SA context due to the high crime levels, including car hijackings and my field site selection was influenced by these concerns.

2010 and June 2011, where I was able to assess recent changes and developments within the study contexts and verify findings.

4.6 Selection of case study communities/neighbourhoods: Justification and innovation

For the second research layer, ten[45] study sites were selected (four from Ugu and six from eThekwini municipality). Table 5 highlights the different case study groupings within each municipality. Local study sites were selected using a multi-stage sampling approach (see Section 4.8.2 below for survey sampling strategy). As outlined in Chapter 1, the main purpose of the local-level case studies is to understand and compare different experiences, understandings and responses to climate variability and potential GEC/CC. This type of investigation provides important insights into whether and how adaptation is taking place across diverse contexts and socio-economic populations. With these intentions in mind, the communities or research sites were selected based on several key criteria: (1). Recent (past five to ten years)[46] experience of flooding, intense storms or other extreme events; (2). Variation in terms of socio-economic status, ethnicity and culture and (3). Communities should be selected from urban, rural and peri-urban locations.

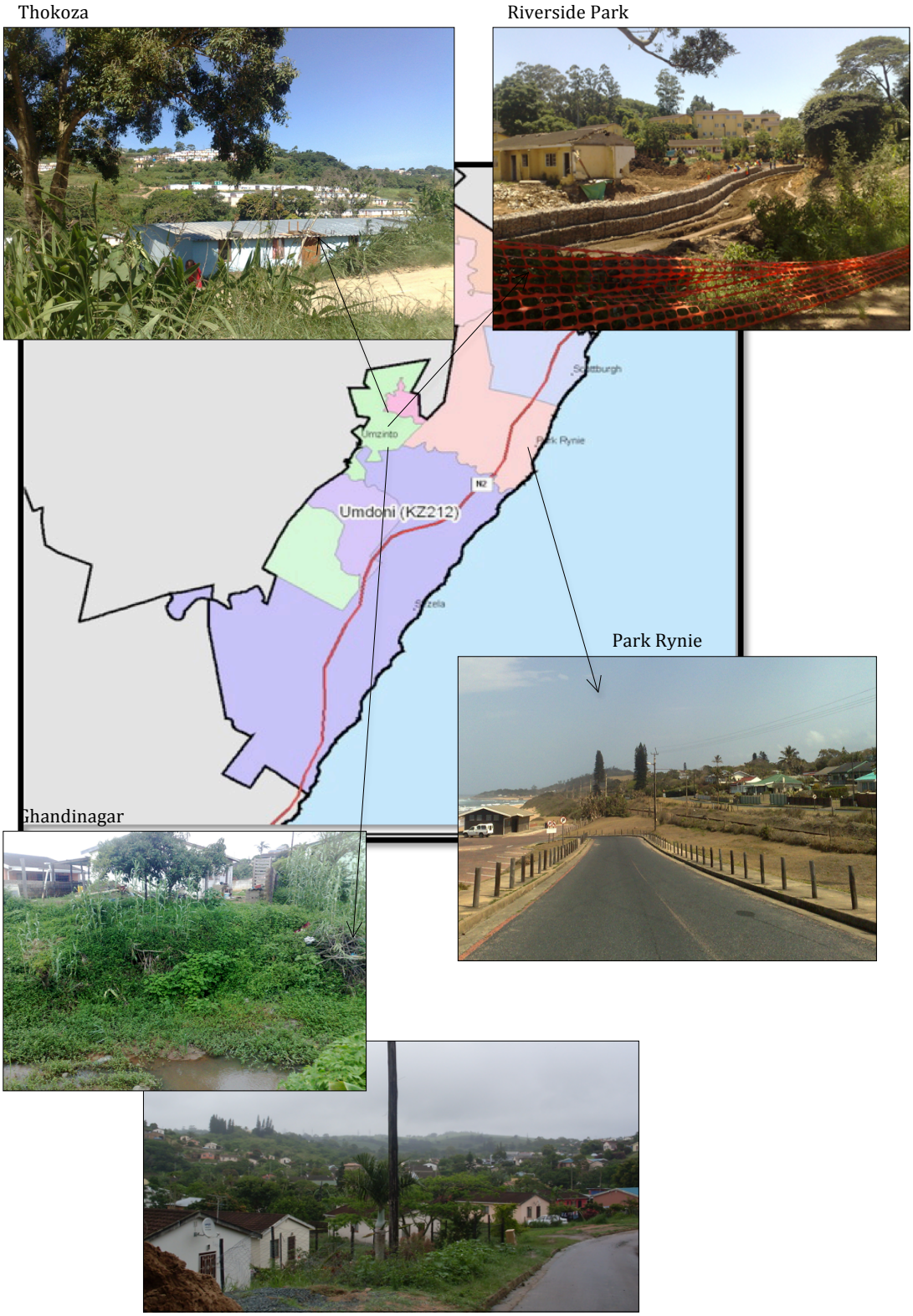
Within Ugu municipality I sampled sites only from Umdoni local municipality (ULM), which shares eThekwini's southern border. Umdoni was chosen due to its direct interconnectedness with eThekwini through shared infrastructure, ecosystems and social systems, but also to facilitate comparison and make the study more manageable as Ugu District is a very large area. Moreover, time and resource constraints rendered travelling to further municipalities somewhat unfeasible, since even travelling to ULM on a daily basis was time consuming and expensive. Ghandinagar Township, Riverside Park

[45] Six in-depth interviews were purposively conducted in Sezela Rural (near Pennington), as opposed to 30 surveys. The purpose of conducting field work in this rural orientated sub-category was to compare responses and experiences to Thokoza peri-urban settlement, where living conditions were considerably rural in nature, with limited access to basic services and employment, with many respondents recently relocated there from rural areas. The differences were quite insignificant since socio-economic, cultural, educational and other indicators were similar. It was thus decided that a round of in-depth surveys was unnecessary and risky due to safety concerns in rural areas pointed out by municipal officials, yet in-depth interview information complements data from the other ULM study sites. As such, Sezela Rural is not included with the other ten key study sites.

[46] This period of time is widely used as an effective benchmark for gathering information about people's recollection of events or experiences and was selected for pragmatic reasons.

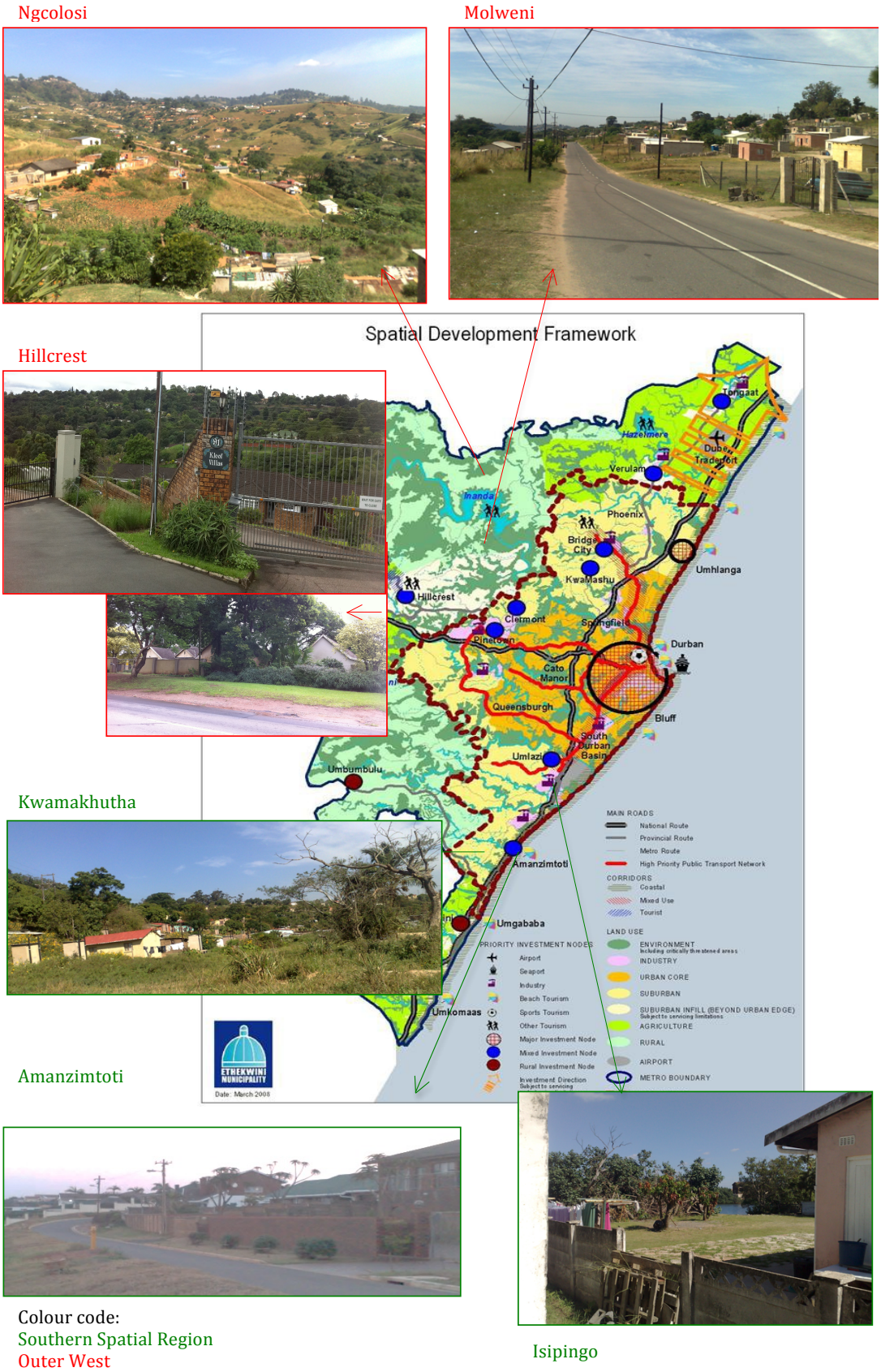
(RSP) and Thokoza settlement and Pennington/Park Rynie are the four neighbourhoods selected from Umdoni (Represented in Figure 5).

Figure 5: Map of Umdoni with a visual representation of the four study sites within this municipality



Map source: Umdoni IDP 2011/12 – 2015/16

Figure 6: eThekwini spatial development framework map with a visual representation of the 6 study sites within the municipality



Colour code:
Southern Spatial Region
Outer West

Map source: eThekwini IDP 2008/9 Review

eThekwini is divided into four spatial regions or functional districts to facilitate spatial planning. Based on the research criteria listed above, I sampled case sites from the Outer West spatial region (Hillcrest/Kloof, Molweni and Ngcolosi) and from the Southern spatial region (Kwamakhutha, Amanzimtoti, Isipingo) (see Figure 6). To facilitate qualitative comparison, if considered together, eThekwini South, Outer West and Ugu study areas are similar in terms of demographic representation.

Table 5: Summary of research sites in Ugu/ULM and eThekwini municipal region

Municipal Region	**Neighbourhood/ Study site**	**Settlement patterns and housing description**	**Income levels**	**Race and language profile**	**Site characteristics**	**Recent extreme events in area**
UGU /UMDONI MUNICIPALITY	GHANDINAGAR TOWNSHIP Peri-urban	Densely populated township	Low	Indian English	Floodplain, poor drainage	Flooding
	RIVERSIDE PARK ESTATE Peri-urban	Council Housing Units, single story and flats	Low	Indian English	Floodplain, poor drainage	Flooding
	THOKOZA SETTLEMENT Peri urban	Transient and informal Housing	Low	African Zulu	Floodplain, poor drainage, inadequate storm water outlets	Flooding
	PARK RYNIE/PENNINGTON Urban	Suburban formal privately owned, stand alone housing	Middle	Mixed Race English, Afrikaans, Zulu	Mainly flat land, susceptible to flooding, poor drainage	Flooding
ETHEKWINI SOUTHERN SPATIAL REGION	ISIPINGO ESTUARY Urban	Suburban formal privately owned stand alone housing	Middle	Mixed race, mianly Indian Mainly English, some Zulu	Estuary properties, susceptible to flooding	Flooding and storm surge
	KWAMAKHUTHA Peri urban/rural	Mix of RDP government housing, and privately owned formal and informal housing structures	Low	African Zulu	Varied landscape, poor drainage	Extreme storm/'tor nado event
	AMANZIMTOTI Urban	Suburban formal privately owned stand alone housing	Middle to High	Mixed race, mainly white Mainly English, some Afrikaans and Zulu	Varied landscape, drainage problems	Flooding
ETHEKWINI OUTER WEST SPATIAL REGION 78438ha (34% of municipal region), 50% under traditional authority)	EMBO/NCGOLOSI Rural	Rural dwellings	Low	African Zulu	Varied landscape, near dam, poor drainage	Flooding
	MOLWENI Peri-urban	Mix of RDP government housing and informal dwellings	Low	African Zulu	Varied landscape, poor drainage	Extreme storm events- 'tornado event'
	KLOOF/HILLCREST Urban	Suburban formal privately owned stand alone housing	Middle to high	Mixed race, mainly white	Varied landscape	Extreme storm events- 'tornado event'

The research groups or clusters represented in Table 5 differ culturally, politically and socio-economically. Collins (2008:34) explains, "Distinctive types of residential landscapes combine particular groups of people, ecological communities, and built environments in 'place'". Complex combinations of physical and social features that define different residential landscapes create patterns of differential risk to the effects of GEC as exemplified in Chapter 8. Therefore, the selection of geographically, socio-economically (low, middle and high income)[47] and culturally diverse communities from across rural-urban continua was premised on the assumption that different experiences would emerge in these different contexts. Indeed, different settlements/neighbourhoods probably experience and respond to weather extremes and climate variability in different ways (influenced, *inter alia,* by cultural beliefs, micro-histories and politics, livelihood assets, location). Sampling from varying residential areas in different pockets of the municipal landscapes is viewed as innovative and important since many GEC studies focus on either urban or rural areas rather than researching these interconnected areas in an integrative manner.[48]

Linked to cultural and political considerations, it was important to meet with the local *Nkosi* (chief headman) in rural contexts to inform them about my research and to gain permission for undertaking fieldwork within the community over which they preside. Despite the fact that the research is not of a particularly politically contentious or sensitive nature, it was also important to gain the trust of local councillors and municipal officials through confirming access to specific communities and notifying them of the nature of my research. These 'gatekeeper' contacts were important for gaining legitimate and uncontested access to the 'researched' in the study sites (Lesley and Storey, 2003). Moreover, establishing these initial connections was useful for gaining contacts details and arranging interviews with selected officials.

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[47] Classifying households as low, middle or high income is contentious and subjective. To avoid contestation by research participants, household socio-economic classification was based on self-ascription (i.e. households categorised themselves as low, middle and high income based on their own criteria).

[48] Rural, peri-urban and urban/suburban community classifications are based on official municipal typologies and as stated in Section 1.4 were selected not according to population density (a common classification criteria) but rather access to services and other key features.

4.7 Methods of data collection

The research questions are identified in Chapter 1; this section details the approach for addressing these questions. The nature of the research lends itself to using multiple/mixed methods of data collection. Kitchin and Tate (2000) argue that the selection of research method(s) entails choosing the method that is most appropriate relative to the knowledge and data that the researcher requires. Adopting a mixed methods approach provided the advantage of investigating multiple and multi-scalar issues and for fostering triangulation of data, useful for comparing the consistency of results. A reflexive and iterative research approach was adopted. The approach to answering the research questions is based on various major components: literature review, policy and key document analysis, interviews, surveys, focus groups and participant observation.

The literature review was continuously developed throughout the research process. Prior to and during the fieldwork period in Durban and ULM, it was necessary to investigate the policy context and institutional framework that influences CC responses and understandings across multiple scales. Thus, I undertook extensive desktop research of relevant primary and secondary sources, including policy frameworks, legislation and strategic documents and newspaper articles. This research facilitated the development of historical and geographical contextual insights into the political ecology of GEC/CC responses and vulnerability.

Table 6 provides a summary of the research questions and the methods used to collect the required data. In accordance with a multiple methods approach, data derived from the different methods inform each of the research questions.

Table 6: Key methods used to answer each research question

Research Objectives	Key methods used to generate data							
	Policy analysis	Institutional analysis	Document analysis (primary and secondary sources)	House hold survey	In-depth semi-structured household interviews	In-depth semi-structured key informant interviews	Focus groups	Informal informants
To undertake a comparative analysis of whether, to what extent, and how processes of adaptation are taking in place in the neighbouring eThekwini Metropolitan and rural Ugu District municipalities	✓	✓	✓	☑	☑	✓	☑	✓
To determine the relationship between Ugu and eThekwini and between these municipalities and higher government spheres, and the likely effect of collaboration or lack thereof on GEC/CC adaptation initiatives	✓	✓	✓	☑	☑	✓	☑	✓
To explore differing perceptions and understandings of climate variability and change and its likely effects within and between the case study sites	☑	☑	✓	✓	✓	✓	✓	✓
To investigate divergent experiences and responses to GEC within the case study sites and consider the influence of municipal – public relations in constructing them	☑	☑	✓	✓	✓	✓	✓	✓

Key: ✓ Method used directly to answer research question
☑ Complementary data source - triangulation

4.7.1 Addressing research questions one and two

The main method used to elicit data to answer the first research question was in-depth interviews with various key informants from municipal and external organisations.

The key informant interviews are divided into six different categories. Stakeholders were chosen with the aim of representing government, civil society (including NGOs,

religious groups), traditional government and the private sector. Local level household interviews are discussed in Section 4.8.3 in relation to the third and fourth research questions.

Table 7: Interviewee categories and organisations

Interview Category	**Organisation**
1. Provincial Level	Department of Agriculture, Environmental Affairs & Rural Development (DEA&RD) - Environmental Planning and Co-ordination Unit - Environmental Assessment Department Wildlife and Environment Society of South Africa (WESSA)
2. Municipal Government officials Department: Department:	 Ugu/Umdoni Municipality Environmental Services Disaster Management Unit Planning Department eThekwini Municipality Environmental Planning and Climate Protection Branch (EPCPD) -Policy Implementation branch -Climate Protection branch Development Planning Unit Municipal Institute of Learning (MILE) Imagine Durban Branch Disaster Management Unit Coastal Engineering, Stormwater and Catchment Management
Local level: Key informants	
3. Political Organisations	*Amakhosi's* (traditional leaders) Christian Democratic political party Kwamakhutha youth league Qadi Tribe Land Dispossession Committee
4. Non governmental institutions	WESSA, Coastwatch (subsidiary of WESSA), Primary School, Religious organisations, environmental consultants, Ghandinagar Flood Victims Committee (FVC), Riverside Park Ratepayers Association
5. Local Level: Household interviews	Transient Settlement, Park Rynie/Pennington, Ghandinagar Riverside Park, Kwamakhutha, Isipingo, Amanzimtoti Ngcolosi, Molweni, Kloof, Sezela Rural
6. Informal Informants	University of KwaZulu-Natal Centre for Civil Society (CCS), academic representatives from various departments, South Durban Community Environmental Alliance (SDCEA), community informants, research assistants
Note: please see Appendix III for a complete coded list of interviewees	

Informants were all interviewed in an in-depth, semi-structured and open-ended manner. This approach allows the interview to unfold in a conversational manner and facilitates flexibility to respond to emerging themes and data, guided by a thematic interview schedule (Kitchin and Tate, 2000; Davies et al, 2002). Interviewees were asked a set of thematic questions developed in light of the research objectives as well as standard introductory 'ice breaker' questions (e.g. roles and responsibilities). Asking

respondents within the same research category certain similar thematic questions facilitated data analysis and allowed for effective comparison of responses. The ordering of questions varied according to the direction of the discussion. Interviews took place mainly during office hours at the interviewee's workplace but in two instances the interviewees preferred to be interviewed at home.[49] Thematic interview schedules for the different target groups are provided in Appendix IV.

As explained in Chapter 6, the nature and extent of inter- and intra-municipal collaboration is influenced by the effectiveness of provincial and national level support structures and the relationship between municipal and other government spheres. Hence, it was necessary to engage with provincial-level officials, supported by documentary analysis, in order to gain an inclusive understanding of these structures and vertical government relations. Provincial-level informants provided useful insights into macro-level trends and policies in SA and KZN province relating to CC and key development issues. These representatives were questioned about provincial and municipal-level responses, adaptive capacities and preparedness for addressing GEC/CC. Moreover, I enquired about collaboration and communication (or lack thereof) between different government spheres, with specific reference to CC policies and strategies.

There are five main groups of interviewees at the local scale. Efforts were made to interview municipal officials of varying seniority and from multiple departments to avoid bias and ensure multiple and holistic viewpoints were attained. I interviewed more municipal officials from eThekwini than Ugu/ULM, due to the greater size of the municipality and the fact that relevant Ugu and ULM municipal personnel were, at times, difficult to ascertain and several were non-responsive. Nevertheless, other than the few non-responses, no officials from either municipality declined to participate and all gave generous amounts of their time, with interviews often taking over an hour, thereby providing in-depth information. Local environmental consultants who work in both municipal areas were also interviewed, as well as key non-governmental organisations that work for/with with the municipalities. Such interviews were very useful for gaining external insights into municipal dynamics and responses to GEC/CC.

[49] These two interviewees preferred that interview to take place at their home in order to avoid disruptions in their office environment.

Government official interviews were also complemented by interviews with local political figures/leaders, religious leaders, two traditional leaders and a traditional healer. These stakeholders were questioned about both similar and specific issues relating to their particular functions, expertise and experience. The diversity of interview respondents allowed for effective triangulation of data and provided diverse insights for answering the research questions. Interviewees from the above categories were sampled through a combination of purposive and snowballing techniques (Bryman, 2008) whereby an initial sample was chosen strategically on the basis of relevance for the research questions followed by these initial interviewees providing further relevant stakeholders for the study.

Key informant interviews were all done in a face-to-face manner on a one-to-one basis, except for three occasions where I met with two representatives for a joint interview at their request. Participation in numerous local conferences, stakeholder workshops and community projects (see Appendix V) also served as important information sources for answering all of the research questions. These were crucial networking opportunities for establishing research contacts and learning useful information through informal discussions often involving interesting 'off the record' comments.

4.8. Addressing research questions three and four

I adopted a range of research techniques to answer questions three and four. Moreover, the data gathered for questions one and two are drawn on to compare and complement data gathered for these questions.

4.8.1 Questionnaires/surveys

A main method to elicit data to answer the third and fourth research questions was a household survey/questionnaire (shown in Appendix VI). A core objective of research questions 3 and 4 is to understand the potential and constraints for GEC adaptation and adaptive capacity within the local study sites. An effective means for assessing these is to examine recent impacts of and responses to extreme climatic events and climatic variability within particular areas, while accounting for the broader political economy and institutional framework (Adger et al, 2003). Thus, an overarching purpose of the surveys was to attain data that facilitate comparability of differential adaptive

capacities, perceptions, experiences, responses and vulnerabilities to GEC between the research sites.

Through adopting a theory-driven approach, the questionnaire design was guided by PE insights, the systems-based or starting-point approach to vulnerability, as well as the livelihoods framework explained in Chapter 2. Here, in addition to considerations such as social, natural, economic and physical resources, livelihoods are understood through a distinctly political-ecological and geographical lens, emphasising the importance of 'spatialising' livelihoods and recognising the complex intersections between space, power, culture, history and the biophysical environment that shape livelihoods. To gain insights into these complex livelihood features, open-ended exploratory questions complemented closed survey questions.

My focus is on *current* vulnerability and adaptive capacity to climate variability or potential GEC/CC as a proxy for gaining insights into future adaptation possibilities and limitations (see Chapter 2). Indeed, understanding current vulnerability is important as it represents the benchmark from which any diminution of vulnerability via adaptation must take place (Brooks, 2003). While scenario-based approaches are often applied in GEC studies, the starting-point approach is thus adopted as the most appropriate for this research (see Chapter 2). Crucially, as exemplified in Section 2.3.5 starting-point vulnerability assessments are grounded in the present and in specific contexts, focusing on existing capacities. In-depth household interviews (see Section 4.8.3) complemented survey data and helped to provide deeper insights into past and present responses to climate variability to help determine whether and how these have shifted over time and whether responses can be understood as coping or adapting. Theoretical insights into coping and adapting (outlined in Chapter 2) helped to facilitate the distinction between them. More broadly, the questionnaires served to elicit socio-demographics of households (and, by extension, case study sites), as well as environmentally and socio-economically contextualise understandings and experiences of GEC/CC effects.

In contrast to many vulnerability and sustainability studies, the intention is not to develop aggregated indices of vulnerability that can be statistically ranked and weighted (e.g. Bell and Morse, 2008). As Chapters 7 and 8 show, understanding vulnerability is extremely complex, with many diverse, interlinked drivers within different contexts. In

their recent book on assessing vulnerability to GEC, Patt et al (2011: 20) conclude that one of their central research findings is "that the most useful information for decision-makers is that which shows the separate causes and drivers of vulnerability, rather than presenting vulnerability in an aggregated form." This research follows a similar preferred approach yet also highlights the interconnectedness of causes and drivers of vulnerability.

Importantly, drawing conclusions regarding vulnerability to GEC/CC is problematic as it is difficult to prove whether current extreme events and changes in weather patterns are evidence of and related GEC/CC, or simply outcomes of natural climate variability (see Section 2.4.2). To avoid contestation, I have used vulnerability to present climate variability as a proxy for understanding likely GEC/CC adaptation possibilities and constraints, as is often done in this research field (e.g. Eriksen, 2000).

This is a predominantly qualitative study; however, the survey is both quantitative and qualitative, using closed, ranked, as well as open-ended questions to allow for respondents' perceptions and experiences to be communicated without being constrained by closed, predetermined and limited response categories/choices. I had various justifications for this approach. First, CC is a relatively new and even unfamiliar topic for some of the participants and is understood and responded to in diverse ways. Thus, I felt that providing exclusively pre-determined and set choices for the majority of questions would be inappropriate and preclude possible responses that I had not apprehended. Furthermore, I did not want to impose categories on respondents but wanted to learn participants' own views without being completely restricted by my pre-conceived ideas and theoretical viewpoints. This technique proved to be effective since the surveys elicited very rich and varied data, which effectively captured the diversity of perceptions, responses and vulnerabilities to GEC/CC within the research contexts.

The plausibility of this approach was also supported by the fact that a small research team (consisting of myself and one or two other translators/researcher assistants at a time) conducted the surveys, as well as the manageable small sample size of thirty surveys per research area. The household surveys were conducted orally in a door-to-door, face-to-face manner. This was viewed as the most appropriate approach to avoid precluding the illiterate from participation. In the case of Zulu-speaking households, my

translators transcribed the survey answers into English throughout the survey process, thereby allowing me to request further detail or clarification as required for the open-ended questions. For English and Afrikaans-speaking households I conducted the survey while recording answers, with my research assistant simultaneously transcribing for data back-up purposes and to ensure responses were fully captured.

The first draft questionnaire was piloted with six households within the research locations. A condensed, self-administered version of the survey was also piloted with 82 out of approximately 350 diverse attendees at a public 'Climate Action Day' hosted by eThekwini municipality. Piloting the survey was important for several reasons. First and foremost, it shed light on the appropriateness of questions in terms of possible misunderstandings that arose. Second, in some cases, answers showed that the question was not clearly worded and led to off-the-point responses. Piloting also allowed me to test the appropriateness of the survey length. Testing revealed that there were too many questions because some respondents became distracted and irritable towards the end and provided short, incomplete answers. I tailored the survey accordingly and only three participants consequently raised concerns over the survey length. In practice, the time taken to conduct surveys ranged from 25 to 80 minutes, depending on the talkativeness and interest shown by the respondents. The longer surveys were particularly rewarding, with respondents showing a keen interest in the research and welcoming me/us into their homes to meet their families and share their life stories.

4.8.2 Survey sampling strategy

As alluded to above, the survey groups were determined using a multi-stage sampling approach. The specific neighbourhoods or study sites within the broad study areas were sampled using a clustered sampling approach. Cluster sampling allows interviewers to be 'geographically concentrated' and is appropriate for research such as this where survey samples needed to be drawn from large regions (Bryman, 2008; DeVaus, 2002).

The clusters or groupings were delineated on electronic street maps and aerial maps[50] to determine the boundaries of the survey areas. I attempted to ensure that each cluster/neighbourhood grouping contained approximately 300 households from which

[50] Accurate street maps were not available for all research areas (e.g. Ngcolosi) thus electronic aerial maps were used to delineate the survey areas.

to sample.[51] Due to varying densities and settlement patterns, the areal extent of 300 households differed considerably among research sites. Feasibility issues, specifically time and budgetary constraints, were principal considerations in determining sample sizes. After reviewing 45 completed surveys in the first site (Thokoza transient settlement), it was evident that a sample frame of 30 surveys per study area was sufficient to attain the data required to answer the research questions, while keeping data analysis within practicable limits. Thus 30 households from each research site were consequently sampled.

For the household-scale, prevalent approaches such as random or systematic sampling were unsuitable since these are suited to "large, relatively homogenous but geographically centred populations" (Simon, 2006b: 169). Moreover, reliable population data were not available for each research site (e.g. transient settlements). Hence, households were sampled purposively; every third household within the delineated case site was approached. If the third household was not available, the next available household participated in the survey. This approach helped to ensure that a demographically diverse range of participants was sampled. In line with the intended purpose of the surveys the samples were not devised to be completely representative of broader municipalities but of specific local neighbourhoods or community groups within the respective municipalities.

Survey data were supported by complementary data sources attained through various methods such as site observation, informal discussions with local residents, attendance at public meetings and through post-survey, in-depth interviews. Indeed, questionnaires served as a platform for agreement to participate in in-depth interviews, which, in turn, served to complement and verify questionnaire data.

4.8.3. In-depth household interviews

While the surveys provided rich and often detailed responses, I felt that it was important to conduct in-depth interviews in each study site in order to gain a more inclusive and holistic understanding of certain issues raised in surveys and other data sources (e.g. complex cultural and religious beliefs) and to facilitate data triangulation. Semi-

[51] Exact numbers are difficult to verify due to the complex layout and informal/transient nature of some housing and varied accuracy of available maps.

structured, open-ended, in-depth interviews were thus designed to provide deeper qualitative data on personal perceptions, responses and experiences of climate variability (including extremes) and vulnerability thereto. Section 4.7.1 outlined the rationale for this type of interview. Household-level interviewees were asked certain standard questions and specific questions relating to particular issues raised, such as cultural and religious beliefs and local politics, amongst several others. Through following a flexible thematised interview schedule, the research was not only driven by my interests and intentions but also by the concerns, experiences and perceptions of the interviewees (Hennink et al, 2011).

The purpose of the interviews was not to be representative of the broader population but to understand how individual people make sense of, experience and respond to climate variability and GEC within the research contexts. Questions regarding awareness and understanding about GEC/CC were important for gaining insights into perceived causes and effects of GEC/CC and extreme events, which influence the type of actions taken in relation to these phenomena. Interviewees were asked a range of diverse questions. Questions about responses and experiences of climate variability attempt to reveal measures taken by households to avoid or reduce impacts (precautionary or reactive) and to help establish whether these measures are coping or adaptive strategies. Discussing household vulnerability to GEC/CC and climate variability helps to understand each respondent's views about vulnerability drivers and household and municipal capacities to respond to GEC/CC and climate extremes.

Questions relating to broader development concerns and municipal government responses to GEC/CC investigate individual/household views on municipal performance and ability to respond to GEC, community-municipal relations, as well as individual views on the relations between development and addressing GEC/CC. The thematic household interview schedule is provided in Appendix IV. Interviewees were selected randomly from the completed household surveys where respondents had noted their willingness to participate.[52] Initially, I anticipated that it would be necessary to do more than five interviews per research area. However, as data collection unfolded I realised that, combined with the in-depth information gathered from the other research

[52] Interviewees from Sezela Rural were sampled in a purposive manner, based on availability of household respondents at the time of visiting the area.

tools, specifically the dense surveys, this number would be excessive and somewhat unmanageable. In total, I conducted 45 key household interviews. Appendix III categorises and codes the interviews according to the study site/neighbourhood in which they took place. Between 3 and 6 interviews were conducted in each site.

Most interviewees were contacted in advance to arrange a suitable interview date and time. Many interviews were conducted after hours, which suited respondents in full-time employment. For those interviewees who did not provide contact details or did not have telephones, I would visit their home and request an interview. Sometimes this would be a suitable time and other times we used this encounter to arrange a suitable future interview date. Interviewees ranged in age and gender but all were adults (classified as over 18). Interviews were often a lengthy process, the shortest one taking 45 minutes and the longest over two hours.

Significantly, people have their own ideas about what constitutes a household, who should be considered as part of a household and the household head (Adato et al, 2007). This can potentially add complexity to the research process. To avoid this, a household was simply defined as a unit that cooks together and I encouraged households to nominate a household representative to participate in the interview. Stakeholders commonly nominated a housemate based on perceived knowledge of the research topic or relevant experiences to share. While most household interviews were conducted with one family member at a time, sometimes other family members present showed interest and contributed to the interview. Thus, sometimes answers were based on individual perceptions and other answers reflected family or household experience.

4.8.4. Focus Groups

On five separate occasions, in four different case study areas, I conducted impromptu focus groups. The focus groups occurred as follows: Riverside Park: 6 participants, Ghandinagar Township: 5 participants, Kwamakhutha: 3 participants and Ngcolosi: 4 participants. In these instances, while conducting surveys with an individual outside their houses, passers-by or neighbours approached us out of curiosity and, after showing interest, I requested that they stay and participate in a focus group discussion. Thus, after completing the survey with the initial respondent we would sit or stand together in a group and discuss key issues raised by the participants and myself while I guided the

discussion to avoid off-topic discussions and encouraged less vociferous participants to contribute. The focus groups did not unfold in a traditional manner where structure, timing, location, age and gender factors are predetermined (Bryman, 2008). However, I was well prepared, having planned an agenda beforehand in preparation for intended focus groups and I also used the key themes from the interview schedules to guide to discussion.

Focus groups are variously defined in the literature. Simply put, focus groups are guided group discussions of selected topics where emphasis is upon interaction within the group (Bryman, 2008). The number of participants required is a central defining characteristic and while it remains debated, three participants are often accepted as the minimum number required (Hopkins, 2007). As highlighted above, the focus groups ranged in size from three to six participants. Moreover, one group (Ngcolosi) comprised only females and the others both male and females. As moderator, I endeavoured to co-ordinate the focus groups in a diplomatic and effective manner without disrupting the conversation flow (Lloyd-Evans, 2006). In one instance, I did not have my recorder to hand so my assistant and I took notes throughout the session and compared these directly after. In the other three cases, the discussions were recorded, with the consent of participants, while my assistant and I took notes. The group discussions ranged from 25 to 90 minutes in duration, depending on the talkativeness and sustained interest of the participants. The focus groups were valuable tools as they generated added insights into the socio-cultural, political and other dynamics within the communities. Due to the considerable amount of data generated through the various other research tools and participation in community workshops and stakeholder meetings, it was not necessary to undertake additional planned focus groups in the remaining areas.

4.8.5 Treatment of data and analysis

Various sources of primary and secondary information were collected throughout the research period, including interview and focus group data, survey material, policy and other key documents, newspaper articles and other printed materials (such as information leaflets) and notes taken from conference and workshops. Most key stakeholder interviews listed in Appendix III were audio-recorded. A few key stakeholder interviews, including household interviews, were not recorded due to participants' reluctance when requested. However, in these instances an in-depth

recording was still permitted since detailed hand written notes were taken throughout and directly after the interview. Notes were also taken during the audio-recorded interviews in order to ensure that a back-up source of data was compiled and to note key aspects such as facial expressions, hesitance and so forth (Kitchin and Tate, 2000). All audio-recordings were transcribed as soon as possible after the interview or focus group to recall and record important details and points that had come to mind during the process. Furthermore, to add to the quality of the transcription process, a separate document was keep next to the computer to record specific ideas and lines of enquiry which emerged during transcription (Kitchin and Tate, 2000). For the interviews that were held in Zulu, Sibongile translated and recorded the interview in handwritten notes directly in English throughout the interview to allow me to lead and introduce probing questions. Following the interview, we would discuss it in detail and record further important details.

The mixed methods used for this study generated structured (e.g. responses to close ended questions and figures) and unstructured (responses to open-ended interview questions) data sets for analysis. Survey data were thematised/classified, coded and quantified. Survey data were captured using the "manual data entry method" using an EXCEL spreadsheet package (De Vaus, 2002: 159). Responses to each question were listed in a column. A coding scheme was generated for each question and each response was assigned a code, listed in the column next to responses. I developed my own classification system for open-ended questions according to types of responses given. Following this, coded data were quantified and analysed. Data sets for each of the ten research sites were captured in separate workbooks then combined in a final workbook to facilitate comparison between the data sets. Recording data from research sites separately also facilitated cross-referencing and data manageability for emphasising key aspects relating to specific areas for presenting results in Chapters 5-8. Due to the volume of surveys, thematisation and coding for the open-ended questions took a great deal of time as I chose to do this meticulously, manually and independently. However, this was a valuable process as this was done upon return to London and helped to re-immerse myself in the material and engage with the data in a detailed manner.

The focus was predominantly on generating descriptive statistics to summarise patterns in the responses (De Vaus, 2002). Descriptive analysis is conducted and presented

according to various forms (e.g. tabular, graphical and statistical) in Chapters 5-8 (De Vaus, 2002). Dey's (1993, in Kitchin and Tate, 2000) qualitative analysis approach described below was also adapted for thematising/classifying and analysis of open-ended survey questions. This qualitative approach provides a useful set of guidelines for the analysis of complex data sets as it facilitates the extraction of key themes, categories and sub-categories and analysis of patterns and interconnections. It can be understood as an 'omelette approach' to analysis because in order for interpretation to be possible, the collected data are 'cracked' open into 'pieces' then mixed together again. Dey (1993, in Kitchin and Tate, 2000) further suggests that there are three distinct phases of qualitative analysis; the description of data, classification and lastly, analysing the interconnections between concepts. The first phase, description of data, is important as it involves contextualising and presenting data in a comprehendible way. This phase involved detailing the social context in which the data were collected and timeframes of data collection in order to provide a coherent outline to position the analysis (Kitchin and Tate, 2000). Chapter 3 provides the background for understanding the meaning of the data.

The next phase, classification, involves making sense of data to help present findings in a meaningful and understandable way (Kitchin and Tate, 2000). Practically, this entailed careful analysis of hard copies of each interview and colour-coding data according to different categories, themes and storylines that emerged. Transcripts were then compared for patterns, connections, potential causal relationships, as well as contradictions and irregularities. Hajer's (1995) discourse analysis framework was kept in mind during analysis so that dominant 'storylines' and policy vocabularies could be detected. Discourse analysis involves theoretical concepts and assumptions as well as methodological prescriptions (Hajer, 1995) (see Section 2.7.1).

Discourse analysis focuses on eliciting people's perceptions and understanding of an issue through analysing their discourses or the words and language that they use. Thus, discourse analysis assists in the identification of common and competing perspectives and arguments concerning the adverse effects of GEC.

Once this process of highlighting and organising various themes was complete, the interviews were then reorganised electronically by cutting and pasting the data

according to the various themes, categories and sub-categories that were discovered through hard-copy analysis. This process facilitated effective linking of data, which lead to the final phase of analysis, the interconnection phase, where interconnections between data categories are determined to reveal similarities and differences (i.e. the relationship between the data sets) (Kitchin and Tate, 2000). This final phase was central to achieving the research objectives and presenting findings in an effective manner. Research findings analysed in Chapters 5-8 are organised around the various themes and categories that emerged. The approach detailed above was adapted to analyse transcribed focus group discussions and other data sources.

4.8.6 Positionality and Reflexivity

It is important to think critically about issues of reflexivity, positionality and power relations during fieldwork in order to undertake ethical and effective research (Sultana, 2007). Reflexivity in research involves "conscious self-reflection on the part of researchers to make explicit their potential influence on the research process" while examining critically power relations and the influence of wider socio-political contexts, as well as researcher accountability in data collection and interpretation (Hennink et al, 2011: 20). A reflexive research process can create more nuanced understandings of issues (Flowerdew and Martin, 2005). Practising reflexivity was important throughout the research process while avoiding an over-emphasis on the self and constraining the research process.

Doing research at 'home', as I did, raises different dynamics in terms of insider/outsider concerns and politics of representation from doing research in a foreign context (Mandiyanike, 2009; Sultana, 2007). In short, as a white South African female undertaking PhD research at home − broadly speaking − in the post-apartheid context, through an international research institute I was simultaneously an insider and an outsider. To borrow Smith's (1999, in Mandiyanike, 2007: 65) explanation, the fieldwork did not involve me going "out there" but "back here". However, as Sultana (2007) explains, what constitutes the 'field' versus 'home' is a problematic distinction since even though one might return to the area which one is originally from to do fieldwork, this does not specifically mean that one is researching in familiar environments. Indeed, the areas and communities that I researched were not particularly

familiar to me (with the exception of Amanzimtoti, my home town) and I did not know any of the participant households.

For the most part, I was aware that my characteristics such as gender, ethnicity, nationality, ability to engage in typical conversations and local dialect helped to facilitate research and build relationships over time. Nevertheless, through constantly reflecting on my positionality, I realised that this was not always the case. I realised that my differences as an 'outsider' were shaped primarily by my class and racial identity, as well as my privileged educational background.

In order to facilitate trust and relationship-building within the various communities and to ground myself in the realities of the various research contexts, I spent a significant amount of time in the research areas engaging with local people in an informal manner. In most neighbourhoods, especially in Ghandinagar and RSP, people were very welcoming and several individuals willingly became informal informants for the research duration. These relationships were pivotal for gaining insights into underlying community dynamics, local histories and politics and for gaining the trust of other community members. This notwithstanding, in several instances, particularly within low-income areas and different racial categories to mine, I was reminded of my position as an outsider and how respondents were perceiving me.

Despite constantly emphasising my position as a student, I was associated with owning a car and other technical devices such as a digital camera. Consequently, certain respondents made assumptions about my socio-economic status and opportunistically requested that I donate money for food, clothes and other products. My skin colour also influenced the way I was perceived, as Sibongile, my research assistant, explained, "these people they think white people have money, they think that, even if you explain you are a student and not working, but they think you still have money".

Further, information is not elicited and interpreted in a purely objective and neutral manner but is influenced by the researcher's values, ethics and ideologies shaped by, *inter alia,* disciplinary backgrounds, personal experiences, belief systems and up-bringing (Flowerdew and Martin, 2005). I constantly grappled with my identity as a SA citizen and conscious of the need to avoid bias in terms of imposing any preconceived

personal views that I may have had and focused on balancing interpretation from both an 'insider's' and 'outsider's' perspective. However, for the most part, I feel that my deep first hand experience and understanding of the broad politico-economic and social context and complex dynamics significantly benefitted data collection and analysis.

Furthermore, CC is a widely debated and contentious issue in the international to local arenas and, through my intense research in this field I developed an in-depth understanding of various debates and discourses surrounding CC, including 'science' behind its causes and impacts. During fieldwork it quickly became clear that local-level situated knowledges were highly diverse and shaped by diverse cultural influences and thus did not necessarily match dominant CC debates and discourses (see Chapter 7). Political ecologists emphasise the importance of accounting for and deconstructing a wide array of discourses surrounding the issue of CC (Forsyth, 2008; Robbins, 2004). Hence, to avoid wrongly assuming that my understanding of GEC/CC matched research respondents' understandings, it was important for me to adopt an open-minded approach to the research and account for multiple worldviews and factors such as educational background, in shaping GEC/CC understandings. This was achieved in various ways, including encouraging participants to express their personal views and being respectful of cultural folklores and 'myths' (see Chapter 7) that inform conceptualisations. I also avoided exclusive use of the term 'climate change' in interactions and explained that I wanted to understand the impact of, for example, the 'weather' on people's livelihoods, which respondents were often more confident discussing.

4.8.7 Working with a translator/research assistant

Due to the imperative of employing translators/research assistants, positionality concerns extend beyond researcher-researched dynamics (Bujra, 2006). Crucially, it would have been impossible to carry out this research without the help of my research assistants/translators, especially in Zulu-speaking communities. My basic grasp of the Zulu language is inadequate for administering surveys and interviews in Zulu. I was thus almost entirely reliant on my main research assistant, Sibongile, in Zulu-speaking

communities.[53] For safety and transcription reasons, other experienced research assistants (either S'Bosh or Winnie) accompanied Sibongile and me in certain areas.

The selection and training of research assistants/interpreters is crucial: "A good assistant can make or break one's research and one's relations with the local community, even for local researchers" (Apentiik, 2006: 34). Research assistants were selected on the basis of flexibility, experience and knowledge of the area. Gender was not an influential factor in recruiting a research assistant. The fact that Sibongile and my other research assistants shared a common ethnic background and language with the respondents in Zulu-speaking areas, combined with their ability to establish a good rapport with research participants quickly meant that there were very few positionality concerns regarding translator and researched dynamics. On the other hand, I was concerned about the effect that a translator would have on my positionality and interaction with respondents due to the mediated nature of interaction and the consequent distancing between myself and community members. While I did feel a sense of frustration at not being able to engage fully in discussions I do not feel that their mediated nature had any significant effect on the research process and outcomes.

Furthermore, as Sibongile became more familiar with the research and the information I was seeking, I would allow the survey and interview processes to flow more freely without asking her to translate every sentence. Often, we would reflect on each survey or interview directly after it was held to capture the essence and detail of what was discussed. Confident in her abilities, at times, Sibongile administered surveys in my absence when I had concurrent commitments to interviews and meetings. This helped me to reflect on the effect of my presence on interviewees' responses. In two instances, respondents did raise racial issues: "the whites must stop fishing" (S1, Molweni) and "white people caused this problem" (I3, Sezela Rural) in my absence. However, these were rare cases and my research assistants agreed that neither my presence nor absence had a significant influence on respondents' answers, including racial references.

In other case study areas where I did not require a translator, I sometimes worked alone where I felt it was safe to do so and at other times I was accompanied by a research assistant for security purposes and as a supplementary note taker.

[53] Four out of nine case study communities were predominantly Zulu-speaking.

4.8.8 Ethical considerations

Ethical considerations also arose as a result of my identity. I constantly emphasised my role as a doctoral student in order to dispel any misperceptions and raised expectations that the research outcomes may result in local development, income or any other opportunities. This was important to avoid being associated with an NGO or a government body, which might lead to skewed responses (Flowerdew and Martin, 2005). However, Howard (1994: 21, cited in Valentine in Flowerdew and Martin, 2005: 125) assert, "the very presence of the researcher, by virtue of the respondents' perception of his or her being a powerful person, can generate a whole host of expectations on the part of the respondents". As respondent S22 from Kwamakhutha noted, "I wish this survey could do some change to our nation and develop our standards of living". It is thus likely that due to misunderstanding of my position and the PhD's purpose, certain respondents could have provided slightly skewed answers in anticipation of benefits. Thus, it was important to be sensitive to these issues and read 'between the lines' when analysing responses. Such aspirations and expectations also have a personal impact as I felt despair at my inability to facilitate directly often much-needed improvements in living standards. Indeed, despite having clarified the research purpose, expectations were still aroused in several instances. Other ethical considerations included that I always gained informed consent from research participants to participate, as well as to record interviews and focus group discussions (Brydon, 2006). I also assured informant anonymity, which has been upheld through coding interviews as opposed to referencing individual names and households. I also emphasised my independent position to avoid being associated with the municipality or any organisations.

4.9 Conclusion

This chapter has outlined the research approach and multiple methods applied to answer the research questions. These include, policy analysis, institutional analysis, key document analysis, household surveys, in-depth semi-structured household and key-informant interviews, focus groups and participation in conferences and workshops. In accordance with the mixed method approach adopted, data attained through the various methods are drawn on to answer each of the research questions. Table 6 summarises the main methods used to guide empirical investigations. This chapter has also provided

important contextual information on my research sites for the analysis of results presented over the next four chapters. With the theoretical framework, background understanding and methodology for my thesis in place, the next four chapters address the key research objectives. The next chapter undertakes a comparative analysis of whether, to what extent, and how processes of adaptation are taking place in the neighbouring eThekwini and Ugu district municipalities.

Chapter 5: Responding to global environmental change/climate change in the eThekwini and Ugu municipal regions: Drivers and barriers to adaptation at the municipal-level

5. 1 Introduction and overview

Having outlined a conceptual framework for adaptation to GEC/CC in Chapter 2, the purpose of the empirical component of this study is to understand how adaptation is manifest in reality at the municipal and household-scales. To this end, this chapter addresses the first research objective (see Table 1) through undertaking a comparative analysis of whether, to what extent, and how, processes of adaptation are taking place in the bordering eThekwini/Durban and Ugu[54] municipalities. As explained in Chapter 3, SA's inequitable political-economic complex and social ordering have given rise to municipalities with disparate resource capacities and development trajectories. Such inequities result in differing municipal capacities to provide basic needs, vital services and infrastructure to communities occupying diverse municipal spaces. Inadequate abilities to meet such necessary provisions – largely determined by insufficient finances and other resources − have considerable adaptation implications (Parnell et al, 2007; Satterthwaite, 2011; Heinrichs et al, 2011). As a result, municipal authorities and their local citizens also have very different capacities to cope with, adapt to and resist the impacts of GEC. These divergences are often most pronounced between urban and rural municipalities, as this research attests.

This chapter focuses on challenges and opportunities confronting adaptation at the municipal scale and on assessing disparities and similarities in the neighbouring municipalities' adaptive capacities. Few SA studies have undertaken this specific type of empirically-based analysis and I argue that it is important for both policy and practice since successful adaptation will require that divergent adaptive responses and abilities be addressed, particularly between spatially linked municipalities that share critical physical infrastructure, human settlements, and ecosystems, yet are separated by artificial boundaries. Further, effective responses by vulnerable groups are, in many ways, contingent upon the extent to which municipal barriers to GEC adaptation can be overcome. In turn, responses at these finer scales are shaped by the degree to which root

[54] Umdoni is the local municipality that directly borders eThekwini and case study areas were selected from this municipality (for a variety of reasons, outlined in Chapter 4). Similar issues emerged through my empirical research in these two municipalities and I thus often refer to them interchangeably in the thesis.

causes of vulnerability and constraints to adaptation can be tackled. Understanding such issues requires empirical analysis that helps to uncover macro- and micro-level issues shaping responses and vulnerabilities. While the units of interest for analysis are essentially municipal and community scales, Chapter 3 provides insight into the framing national context, on which Chapter 6 builds in relation to multi-level governance.

Under a PE framework it is important to understand the power-laden relational dynamics among political actors who shape GEC/CC governance. Regarding municipal responses to GEC, my empirical focus is on the individual local officials and elected representatives who make up the city and rural governments. I am interested in what their motivations are, as well as how they experience and respond to the constraints they face within their assigned institutional positions, in the context of concurrent GEC and development pressures. Due to its cross-cutting nature, responsibility for addressing GEC does not fall under one municipal department. Therefore, officials from diverse sectors such as planning and disaster management units were interviewed. Understanding the complexities of municipal responses requires that broad-ranging influences (including the general public, business and higher government spheres) be considered in conjunction with municipal viewpoints. In this light, analysis is also based on key policy documents and interviews with environmental consultants, representatives from higher government spheres, local politicians, as well as key informant community members (e.g. religious leaders, committee leaders). A detailed list of interviews can be found in Appendix III.

Importantly, drawing from Moser's (2009) 'decision-maker-centred-approach', each representative (interviewee) approaches decision-making with their own deeply held ideologies, beliefs, values and capabilities when 'performing' (after Hajer, 1995) their institutional positions. Hence, while each actor may (through their assigned position) represent an institution, municipal department or so forth, they always bring with them personally-held attributes that are not necessarily representative of the workings of the broader institution. Underscoring the centrality of this point for CC governance, Moser (2009: 324) explains, "These personal norms and values constitute the grease or grit in the mills of what is likely to be a difficult governance process". Moreover, individual perceptions and standpoints are always inflected with broader sets of power relations (Bulkeley and Newell, 2010). Hence, various political agendas and issues can be

deciphered through interviewees' voices as they try to exercise power through presenting their knowledge and making their voice heard (Sutherland, 2004). These considerations about the interwoven relations between power and knowledge for decision-making and actions on CC are central to the PE decision-centred analytical approach I adopt (see Chapter 2).

Chapters 3 and 4 outline contextual and background information for both municipal areas. The municipal areas were selected to illustrate diversity of various aspects including politico-administrative organisation and capacity, extent of adaptation planning and action, socio-economic status and population diversity (in relation to, *inter alia,* socio-economic groups, settlement patterns, cultural orientations). The remainder of this chapter unfolds as follows: First, I provide a brief synopsis of key themes raised in the emerging municipal-focused literature on adaptation drivers and constraints and identify the key added contributions and importance of this thesis's findings. Following this, I provide a critical comparative analysis of Ugu (together with local ULM) and eThekwini municipalities' responses to CC, highlighting barriers and drivers thereto, and key distinct differences between the two municipalities in terms of addressing GEC. Finally, the chapter charters major themes characterising municipal GEC adaptation that emerged through empirical investigations.

5.2 Brief synopsis of key drivers and constraints to municipal adaptation

Globally, many cities such as Durban have initiated GEC/CC adaptation plans and several of these 'early adapters' have been studied to varying extents through individual case studies (e.g. *Environment and Urbanization special issues*, 2007; *Habitat Debate*, 2009; Carmin et al, 2011). In SA and more broadly, particularly in developing contexts, under-resourced rural regions have often been less effective and less proactive (for various reasons, as analysed in this chapter) in addressing GEC than their urban counterparts. As this thesis shows, such divergences are often exemplified in the close proximity of contiguous municipal regions. The reasons for, and potential solutions to, such divergences are an under-researched area. As Bulkeley et al (2009) explain, there has been a propensity to focus on the 'leaders' or early adapters. Initial research concentrated on Northern contexts, but this has levelled out to some extent with case studies from the global South proliferating. Consequently, little is known about how, if at all, less prominent urban and rural areas are addressing GEC, and what can be learnt

from those experiences. These observations provide core motivations for my municipal case study choices.

A macro analysis of the emerging literature (e.g. Bulkeley and Betsill, 2003; Robinson and Gore, 2005; Bulkeley et al, 2009; Amundsden et al, 2010; Roberts, 2008, 2010; Holgate, 2007; Storbjörk and Hedrén's, 2009; Moser, 2009; Heinrichs et al, 2011) on municipal CC adaptation reveals several common factors that influence response capacities. Regarding institutional requirements for facilitating GEC/CC action, organisational, technical, human resource and financial capacities are commonly emphasised as being central. Interaction and co-operation, leadership (specifically 'champions'), clearly defined roles and responsibilities and political support for CC adaptation have also been highlighted as important factors shaping local capacities to address GEC/CC concerns. Moreover, the role of public support for municipal CC actions and generating political support has been noted as a driver of CC action at the municipal-level. The ability of municipal bodies to form networked relations (particularly internationally), as well as legislative guidance and support from higher government spheres is also widely underlined.

As revealed in the discussions below, my empirical research findings reiterate the importance of these factors. Significantly, however, they manifest in distinctive ways in specific contexts. The complexities and underlying reasons for these manifestations and how they are, or potentially can be, addressed need to be better understood. Additionally, my empirical results provide novel insights, such as the role of traditional leaders and beliefs in influencing municipal responses to adaptation, which are largely absent in theory, policy and practice in my research context and more widely.

The following sections analyse eThekwini and Ugu's responses to GEC/CC. As will become evident, several of the constraints and facilitators to implementing adaptation measures within the two municipalities are similar but there are also certain distinct differences, shaped by their distinctive histories and social, economic, cultural and political diversity.

5.3 Responding to GEC/CC in eThekwini metropolitan and Ugu district municipalities

Environmental mandates introduced over the past 17 years in SA under a transformed post-apartheid legislative environment have driven a greater emphasis on environmental management at the local government level (Roberts, 2008). However, there have been mixed responses and prioritisations of environmental issues and management at the municipal scale.[55] Several KZN local governments (e.g. Ugu's Hibiscus Coast local municipality) do not even have established environmental departments or functions and where environmental representatives do exist they often have little clout or are placed under an existing department where their efforts are overshadowed or sidelined. As Patel (2008: 368) explains: "environment departments are typically the newest and weakest structures within local government". This argument applies well to the Ugu and ULM municipalities, where the environmental departments were established as late as 2008 and 2004 respectively and are highly under-resourced. On the other hand, eThekwini's environmental department was formed as early as 1994 and is thus well established. This appears to be a national trend, where municipalities with strong urban cores (e.g. Cape Town and Johannesburg) have generally responded to post-1994 environmental mandates more efficiently and consistently than rural counterparts (e.g. Holgate, 2007; Mukheibir and Ziervogel, 2009). Central reasons for this trend, such as strong tax and supportive resource bases, are exemplified in this chapter through the example of metropolitan eThekwini municipality.

While institutionalisation of environmental concerns was initially quite slow, from 2008 the eThekwini IDP has strongly promoted the protection of ecological integrity and emphasises the need to mainstream the City's sustainability into all aspects of City management (eThekwini IDP 2009/10 Annual Review). Furthermore, CC has emerged as a strategic issue characterising the municipality's short- to medium-term plans and the eThekwini IDP includes the requirement for the development and implementation of a Municipal Climate Protection Programme (MCPP) (Roberts, 2008; Carmin et al, 2011). Conversely, it is only in the latest 2011/12 Ugu IDP Revisions that CC concerns are featured explicitly for the first time. CC receives limited attention in comparison to the eThekwini IDP, yet its presence within the document shows that it is emerging as a strategic municipal issue, even if, for now, "it is mainly due to provincial directives"

[55] Technically, district municipalities such as Ugu comprise two levels; the district municipal body and its constituent local municipalities.

(B1). CC receives similarly limited attention in the ULM IDP with little indication of likely significant future change as the draft 2011-2016 IDP makes very little reference to CC and necessary adaptive actions required at municipal and household-scales.

5.3.1 The city of Durban: A climate change leader

From about 2004, Durban began to engage meaningfully with CC. This engagement was initially through the efforts of a single CC 'champion' while "most of the climate change work up until recently, especially at the beginning, was done in employee's own time, outside of working hours and on our own steam" (A1). This has shifted in recent years, with CC increasingly featuring as a mainstream municipal issue and the recent establishment of a distinct CC branch within the Environmental Planning and Climate Protection Department (EPCPD) in 2009. This is a significant development since most municipalities in developing contexts (and indeed 'Northern' contexts), specifically SA, are yet to create a dedicated CC branch as Durban has done.

Durban municipality has been proactive in addressing GEC/CC and is at the forefront of CC action through commissioning a Municipal Adaptation Plan (MAP) (Cartwright and Constable, 2010), as have other metro municipalities such as Cape Town (Mukheibir and Ziervogel, 2009). Roberts (2008) explains that ahead of many other cities worldwide, the eThekwini municipal government has created a 'locally rooted' adaptation strategy that emphasises local implications of GEC/CC and necessary responses. The effectiveness of 'localising' and reframing GEC/CC as a local issue for driving municipal CC adaptation is widely noted (e.g. Satterthwaite et al, 2009; Mukheibr and Ziervogel, 2009). eThekwini is commonly recognised as a forerunner amongst municipalities within the KZN and southern African region; most have yet to embark on such activities to any similar degree (Satterthwaite et al, 2007; ASSAf, 2011).

On the basis of extensive research at multiple scales, Durban has identified water availability and quality, health (including food security) and disaster management as being critically vulnerable to GEC/CC impacts (Cartwright and Constable, 2010). The MAPs are thus focused on the corresponding water, health and disaster management sectors and the need for these sectors to develop and implement adaptation measures in a joint manner. In addition to the MAPs, eThekwini has embarked on several other

progressive CC ventures under their MCPP. The MCPP is endorsed in Durban's IDP (Cartwright and Constable, 2010).

eThekwini's other CC initiatives include, but are not limited to, Community Adaptation Plans (pilot phase), Water Loss Management and Urban Agriculture Programmes, an integrated assessment tool (IAT) (currently under construction), community reforestation projects, a green roof pilot project and the greening 2010 campaign which saw eThekwini endeavouring to offset carbon emissions from the 2010 FIFA World Cup Soccer events hosted in the city (Roberts, 2010; Carmin et al, 2011; ASSAf, 2011) and a landfill-gas-to-electricity Clean Development Mechanism (CDM) project. eThekwini is also unique (particularly among developing contexts) in prioritising adaptation early on in its CC responses. Moreover, their clear distinction between mitigation and adaptation is viewed as somewhat unusual and progressive at the municipal scale (Heinrichs et al, 2009; 2011).

A further key feature of Durban's environmental and CC agenda is D'MOSS (see Section 4.4). D'MOSS is endorsed as providing key functions for CC mitigation and adaptation through, for example, providing critical green urban 'infrastructure' in the form of ecosystem services, including erosion control and water supply and regulation (Roberts and Diederichs, 2002; eThekwini, 2011). Roberts and Diederichs (2002) argue that framing ecosystem services as providing critical infrastructure, with high replacement values, is important for raising the profile of 'green' issues on political and local community agendas. However, my results show that, in practice, this has been difficult to achieve (see Section 5.6.1). As A6 underlined,

> People want development, they don't want environment issues. A lot of people, they see D'MOSS as a very restrictive thing, something that stops development, something that stops them from getting jobs, which are what poor people want.

Hence, depending on the way D'MOSS is individually perceived it may inadvertently deepen the pervasive 'environment versus development' perspective.

As a vulnerable coastal city, Durban has also acted ahead of and in compliance with the national and provincial coastal management frameworks, specifically the recently promulgated Integrated Coastal Management Act (ICMA) (24 of 2008), which requires municipalities to develop coastal management plans (CMPs) within four years.

eThekwini has prepared its own Coastal Management Strategy (in draft form at the time of interviewing) and (at the time of interviewing) is finalising CMPs and concurrent shoreline (SMP) and estuarine management plans (EMPs) (e.g. South Durban SMP), which will assist in the development of sustainable shoreline defence policies (Draft Umgababa CMP; A2).[56] The Ugu district has been comparatively less proactive, with CMPs only "in the pipeline", to be developed once other environmental projects such as ULM's SEA and IEMP have been developed and funding secured (B2, B3). Along with a timeline highlighting key milestones and phases of Durban's CC response can be viewed in Appendix VII.

5.3.2 Underlying challenges to Durban's climate change adaptation agenda

These achievements notwithstanding, eThekwini municipal officials expressed caution by way of highlighting constraints on GEC/CC agendas in the city. The need for much more research, specifically at local community scales, was strongly emphasised. For instance, A1 explained that the CAPs and other CC programmes were being undertaken in strategic areas where working relationships with local communities already existed because engaging more 'unknown territories' (A12), such as tribal land, is more challenging for the municipality due to resistance, political climate and difficulties in gaining access and consent. A1 also underlined that many adaptation options such as food security and catchment management lie in utilising rural areas in more innovative ways. Nevertheless a prerequisite for critical rural-based adaptation is to develop links and working relationships with tribal authorities. These issues emerged as key themes in both municipal areas and are thus further explored in Section 5.8. Moreover, the pilot phase CAP and MAP initiatives need to be scaled up and rolled out across vast, socio-economically diverse areas and various municipal departments where resistance, such as conflicting priorities and interests are likely to be encountered.[57]

Significantly, while eThekwini *municipality* is widely acclaimed for its CC actions, it is important to understand that unlike a unified municipal unit, it is actually specific

[56] Essentially, the costal management *strategy* identifies guiding principles and strategic specifications for coastal management in the city/municipality, which inform detailed action plans contained in CMPs and SMPs.

[57] Importantly, officials from both municipalities felt that my broad-ranging and inclusive research is important for policy development and for the municipality to gain a greater understanding of diverse local level vulnerabilities and dynamics (A1, A2, A3, B4, B6).

departments (particularly the EPCPD) and a handful of key individuals who principally underpin and continue to drive the CC agenda. While CC efforts could certainly not have progressed without a certain degree of broader institutional support and acceptance, eThekwini's CC agenda still faces formidable barriers.

Environmental efforts have not been unchallenged, as a prominent SA academic recently exclaimed: "eThekwini's environmental manager is surviving in a shark pool where there are so many officials with vested interests against the progressive environmental plans" (pers.comm. 10/09/10). Reiterating this point, a prominent municipal official (A1) explained that there have been "open attacks on environment agendas" from certain powerful quarters, and felt that in certain respects the CC agenda was moving backwards and proving more difficult to implement than anticipated.

An illustrative example relates to a cutting edge 'sea level rise (SLR) viewer' developed by a municipal employee, which models shore level regression according to three scenarios (0.3m, 0.6m and 1m) for the eThekwini coastline. While the viewer is now publicly available (to assist local adaptive decision-making), it encountered initial resistance from city authorities who were concerned about public reactions, especially because the viewer identified key development and investment nodes such as Durban central beachfront as vulnerability hotspots (A6). Due to the fact that the central beachfront's 'Golden Mile' promenade/walkway[58] was already underway (initially without a sea defence system) in preparation for the 2010 Soccer World Cup, attempts were made to 'squash' the viewer and it was initially "taken off the GIS systems" (A9). Nevertheless, following a "very contentious process" and much persuasion, authorities agreed that a defence structure (constructed in 2010) is required for the promenade (A2). Hence, while several progressive adaptation initiatives exist within the municipality, there have been significant challenges to develop these from external influences and within the municipality, mostly shaped by complex power relations, competing interests and politics. These struggles are largely absent in the literature on Durban's CC response and can only be revealed through detailed empirical investigation and probing.

[58] This development extends the existing promenade, which has shifted seawards in parts. The 'Golden Mile' refers to Durban's central beachfront area.

5.3.3 Ugu (including ULM) municipality: struggling to adapt

In stark contrast, eThekwini's neighbouring Ugu district municipality and constituent ULM appear to be comparatively weak in terms of resources and expertise and lag behind several other SA municipalities in tackling GEC problems. Ugu and ULM's young environmental branches do not have dedicated CC staff or comparable funds allocated to CC specific activities. Ugu has not, to date, initiated comprehensive adaptation strategies. Neither have their six constituent local municipalities. In this sense, the citizens of eThekwini municipality are at a comparative advantage to their neighbours in terms of current municipal preparedness and capacity to deal with GEC/CC, and to support community level adaptation.

Ugu and ULM's approaches to CC have not been as pro-active as eThekwini thus far, since their main focus is on co-benefits of existing initiatives and complying with EIA recommendations and other legal requirements (B1, B2, B4, F6). As B2 explained, "directly, climate change remains relatively low on the agenda, however there are indirect strategies that are now in place such as recycling projects, alien plant eradication programmes, greening initiatives and the SEA and IEMP". Ugu and ULM's current focus appears to be more mitigation orientated as evident in their emphasis on 'greening' projects, including the establishment of green corridors and green spaces (Ugu IDP, 2011/12). Similarly to eThekwini, Ugu has also helped initiate Eco and Wetlands Schools Programmes within the municipal area. Despite the mitigation orientation, the Ugu IDP (2011/12:119) identifies health, agriculture, environment and tourism as key vulnerable sectors that will "need to be assessed" as part of a "long-term initiative" to develop adaptation strategies. Markedly, the IDP (2011/12: 119) underlines that this will be based on "lessons that will have been learnt from the forerunners". My empirical findings reveal that this policy rhetoric and intended CC actions have yet to be adequately translated into practice. As exemplified in Chapter 6, weak horizontal collaboration between Ugu and eThekwini and other SA municipalities is a major restriction to learning from 'forerunners'.

While specific CC projects have not materialised within Ugu and ULM to the same extent as eThekwini, environmental issues in general appear to be increasingly prioritised, with some financial support from provincial government. For example, the KZN Department of Agriculture, Environmental Affairs and Rural Development

(DAEARD) has recently allocated dedicated funds to assist Ugu in the development of an integrated environmental management framework (EMF) for the district, as well as strategic environmental assessments (SEAs) for Umdoni and Umuziwabantu local municipalities. These projects could serve as catalysts for CC-specific action and officials emphasised their potential co-benefits for CC action (B1, B3, C5). However, these opportunities have not been adequately seized as CC does not feature prominently in these initiatives, as evident in the vague 'ameliorative' recommendations such as "planting of trees and better control of traffic flow to reduce carbon emissions" stipulated in the Umdoni draft SEA (ULM SEA Report, 2010: 83). Essential adaptive strategies for vulnerable coastal and floodplain settlements (See Chapter 8) and municipal infrastructure such as recently flood damaged roads and pump stations do not feature. Nevertheless, environmental officials remain optimistic about future environment actions and "envisage that climate change issues will feature more strongly" in the final SEA report and other environmental programmes (B1, B3, B4).

Ugu and several of its constituent municipalities, such as ULM, actively participated in the KZN Local Government Association (hereafter KwaNaloga) Climate Change and Rural Development Summit (as did eThekwini) from 8-10 March, 2010. Ugu drafted an 'Ugu Response Framework', which identifies major CC-related vulnerabilities of key sectors (e.g. agriculture, water and disaster management) and opportunities for interventions in such sectors. However, due to the prioritisation of other pressing issues and lack of municipal backing, there has been no significant follow-through or implementation of this framework to date (B1).

5.4 Recipes for success – key catalysts and drivers for municipal adaptation

Recent experiences of extreme weather events, such as the tidal surge of 2007 and intense storms across the municipal areas, have acted as catalysts for increased awareness and concern amongst municipalities and local citizens. However, GEC/CC adaptation initiatives at all scales remain inadequate.

Several factors have driven CC action within eThekwini, but which do not feature strongly within the Ugu and ULM contexts. eThekwini Environmental Department's

long-term establishment, strong leadership (CC 'champions'), [59] expertise in environmental matters and recent establishment of a CC-focused branch have been major catalysts for the municipality's CC successes. Moreover, eThekwini is at an advantage with its stronger and more diverse resource base, which enhances capabilities to support local inhabitants to adapt to GEC effects through capacity to provide and maintain vital infrastructure and services necessary for CC adaptation.

In the early absence of national level support and institutional frameworks, Durban created strategic partnerships with other external and internal support mechanisms and networks. For instance, Durban has forged productive relationships with external organisations such as consultancy firms, academic/research institutions, and NGOs (e.g. WESSA). Consultancy firms have contributed significantly to several of Durban's flagship CC projects such as the IAT and 'greening Durban 2010' campaign. Ugu and ULM also extensively contract external consultancy firms to undertake environmental and other work (e.g. Umdoni municipality's SEA discussed above). Importantly the role of consultants and other external bodies in terms of capacitating, strengthening municipal knowledge bases, information dissemination and support structures is an underemphasised issue in the literature on municipal-level responses to GEC/CC (e.g. Mokwena, 2009; Mukheibir and Ziervogel, 2009; Roberts, 2010). This is of particular importance in the SA context where such actors appear to play a prominent role.

The EPCPD branch has also forged important international ties with organisations such as the Tyndall Centre for Climate Change research in the UK (Carmin et al, 2009). The creation of strategic relationships with the Danish International Development Assistance Agency (DANIDA) has also helped to create funding opportunities for certain CC initiatives (Mokwena, 2009; A1). Notwithstanding this and other ad hoc funding opportunities, municipal officials underscored the need for consistent and reliable funding through state budget allocations to pursue long-term adaptation priorities. However, as highlighted in Chapter 3, national, provincial and municipal budget allocations for environmental, particularly CC plans and projects remains low. The lack of financial resources was raised as a major impediment to pursuing CC initiatives at the municipal-level, specifically in the less well-established rural Ugu and ULM

[59] CC 'champions' are individual or collective leaders or entrepreneurs who act as catalysts in establishing CC as a central issue within an institution or other establishment.

municipalities that have been less able to forge partnerships with external networks and funders (B6, B3). As A2 attests,

> I guess cost is going to dictate to a large extent. Look, we are a fairly rich municipality; this is where you will find the biggest difference between us and Ugu in terms of response to climate change, they just don't have the available funds.

5.4.1 Distinctive obstacles to addressing GEC/CC in the Ugu/ULM context

Ugu and eThekwini representatives underscored several similar barriers to inter-municipal collaboration and municipal GEC adaptation measures. However, certain important distinctive issues were raised in the Ugu/ULM context. First, Ugu/Umdoni informants noted that the role of the environment department is not well understood by the broader municipal institution, while environmental issues are often seen in a negative light and as a hindrance by other departments:

> I think as much as we trying to institutionalise environment issues in other departments, and it is working to a certain extent, there is the problem that environment is seen in a bad light. Environment is also attached to people; environmentalist people we are not well liked. We are seen as being in the way of development and other municipal functions so we have things like damage to power stations near the sea during the storm surge, why? Because the environment department was not consulted in the first place (B1).[60]

This prevailing situation can be attributed largely to the fact that Ugu and ULM environmental departments are still quite young, combined with the pressing developmental and infrastructural challenges that pervade the municipalities and inadequate institutional understanding of the centrality of environmental considerations in overcoming these. Alleged conflicting mindsets and attitudes held by some municipal employees were also commonly highlighted as an impediment to intra-municipal collaboration and advancing CC agendas:

> There is some kind of willingness to collaborate, but on the other side when it comes to really hard engineers their mindsets are very different and the only reason they do collaborate with us is because EIA's require it; its protocol, not because they think it is important (B1).

[60] This statement alludes to the 'environment versus development' discourse, which emerged as a key theme and is thus further discussed in various parts of the thesis.

While officials recognised that EIA processes are often flawed, they viewed them as a tool for ensuring that environmental and CC issues be incorporated into decision-making across departments (B3, B4, B6, C5, F6).

External officials provided some very interesting insights into Ugu/ULM municipal responses and attitudes towards environment and GEC issues. As highlighted, environmental and CC issues have not risen to the same degree of prominence within Ugu/ULM as in eThekwini. Rather than being integrated and considered as key concerns, F1, a provincial level representative, explained:

> Often, they (municipal management) use their environmental component to actually help them get around non-compliances, so they actually manipulate or abuse the purpose of why an environmental manager is there. It's not that the environmental manager is condoning it, it's because of his position in the ranking of everything; his superiors can go over his head.

With reference to local officials' attitudes towards environmental issues, a prominent consultant (F6) noted,

> Environmental issues are sidelined by our municipal leaders and they seem to encourage a tick the box exercise so they can say 'well, we did it', but I don't think Umdoni is alone in that; there is an awful lot of this 'right, we can tick the environmental box, let's move on now' in a much broader context.

While eThekwini's environmental function certainly has capacity constraints, Ugu and ULM environmental department's financial and human capacity constraints appeared to be more acute and disabling (see Table 3). For instance, Ugu environmental department has much fewer staff than eThekwini, while the ULM environmental departmental is staffed by one key individual (also responsible for parks and recreation, as well as waste management) with the help of an assistant. In stark contrast to eThekwini, the necessity and purpose of addressing environmental issues is not supported and institutionalised in the Ugu/ULM context. Underscoring this point, C5 explained that the ULM environmental representative has,

> Been brow beaten and threatened to the point where he can't perform his functions properly. The guy's got no support at council; his councillors don't support him, his boss doesn't support him, so now how can we even consider that he take climate change concerns on board and try convince his superiors?

Reiterating this point, F6 clarified that, "the municipal council does not recognise the environment's value (HL: so it's not a priority?) F6: No, not at all, and I am not sure we are ever going to get there".

With the above understanding of the divergent municipal responses to GEC/CC and underlying reasons for them in place, the following sections examine the key themes relating to barriers and drivers shaping municipal GEC adaptation that emerged through empirical analysis.

5.5 Institutional drivers and constraints to GEC/CC adaptation

Principal barriers to GEC adaptation underlined by informants relate to the capacities and vulnerabilities of municipal institutional structures and cultures, as well as attitudes and mindsets towards GEC held by stakeholders at various levels. Most (approximately 80%) of municipal respondents underscored inadequate inter-departmental collaboration as a major factor that impacts on municipal capacities to take CC action. A major reason for this is what is known as the 'silo effect';[61] the institutionalised divisions between departments within each tier of government.

Intra- and inter-departmental municipal collaboration is especially important for developing and implementing cross-cutting adaptation measures. Several respondents were concerned that weak co-operation was leading to duplication of efforts and mixed public messages due to the lack of unified GEC/CC campaigns and initiatives (A3 A5, A7, B3, E3, E4). Interviewees gave various reasons for inadequate collaboration. Inter-departmental competition and 'turf wars' were commonly noted: "there is this perception that we are on different teams" (A10), "some departments are quite protective over their information, people step on each other's toes, they don't like that, its like your turf my turf" (A7). Moreover A2 explained that "due to personal issues and other inter-departmental conflicts there is a distinct lack of engagement". Evidently, inter-departmental power struggles are a major constraint to communication, as is also the case with inter-governmental relations (see Chapter 6).

Inadequate capacity, time constraints and inadequate communication channels were also emphasised as principal collaborative constraints. A key underlying reason for inadequate communication, is that, historically, there has not been a tradition of interaction across government departments (vertically and horizontally). Therefore there

[61] The 'silo effect' or 'stove piping' is widely noted as a constraining factor in broader governance literature (e.g. Todes et al, 2009; van Donk et al, 2008). This phenomenon poses particular barriers in the context of addressing CC, which requires collaborative action (Moser, 2009).

are still inadequate communication structures and practices in place and the benefits of collaboration and communication are not always recognised or immediately apparent. This is a broadly relevant issue since, for example, Brockhaus and Kambire's (2009) comparative study of two urban municipalities in Burkino Faso also revealed the centrality of communication structures in shaping local government's adaptive capacity (see also Moser, 2009 and Winsvold et al, 2009) (Chapter 6 reveals similar issues on inter-governmental communication).

A1 explained that, historically, inter-departmental communication and collaboration have been weak and sidelined, but this is beginning to shift slowly, especially through the eThekwini MAP, which has encouraged greater collaboration between certain sectors. However, not all interviewees shared this outlook. As A9, for example, felt that greater emphasis needs to be placed on regular interaction between various sectors and their key roles in GEC adaptation to overcome popular assumptions regarding EPCPD's responsibility to undertake the majority of GEC/CC work,

> People think, well, climate change, it falls under environmental issues, so therefore, the environment department must take care of it and we will follow. No, it doesn't work like that, climate change is a cross-cutting issue, all departments need to engage and set up initiatives. But we need to talk together in regular forums, not just once every few months for the MAP process.

Several municipal representatives (e.g. A1, A9, A5, A7) explained that there are inadequate institutional arrangements or structures in place to facilitate GEC/CC collaboration. A8 underlined the importance of addressing this issue: " the MAP will not work, we can't pull in the role players as MAP develops unless we have the institutional arrangements in place to do so". The dynamic nature of the municipality in terms of constantly shifting personnel and administrative functions, lack of coherence and high staff turnovers were also underscored as principal factors undermining the implementation of unified, cross-departmental adaptation measures.

As possible solutions to collaborative barriers, several interviewees suggested that dedicated staff be allocated and official forums be established to enhance communication, information and experience sharing between departments on a continuous basis. This was viewed as particularly important for CC adaptation measures, which require input and participation from different departments with varied capacities and CC expertise. eThekwini does indeed have an existing function; the

Municipal Institute of Learning (MILE), which is meant to serve this purpose, yet officials felt that MILE needs to be strengthened, particularly with greater staff capacities:

> MILE is supposed to be the knowledge management body and try get departments to talk to each other and prevent duplication of projects, but it is such a massive task in such a huge organisation and you have one guy on the knowledge management pillar and he is trying to do a hundred and one things (A7).

MILE's role is further analysed in Chapter 6. Ugu and Umdoni have yet to create similar potentially facilitative structures.

It appears that the underscored communicative and collaborative barriers will, however, be difficult to overcome, particularly in terms of required transformations in municipal structures and bureaucracy,

> The system is geared to fend off change, there has been no transformation as a result of the climate change agenda, just shifting around and there is likely to be no real change in the system. We are still operating according to the traditional municipal structure with different line functions acting alone (A1).

Linked to intra-municipal collaboration, inter-municipal collaboration, as well as relations between local government and higher government spheres were underlined as pivotal influences on municipal GEC adaptive capacity. Chapter 6 provides an in-depth analysis of multi-scalar relations between the two case study municipalities and higher government spheres in answering the second research objective. Therefore these influences are discussed in Chapter 6 rather than here.

Moreover, municipal size and capacity emerged as key influences on municipal CC responses, particularly with regard to intra-municipal collaboration. In contrast to Ugu and eThekwini's readily acknowledged inadequate intra-municipal collaboration, an ULM representative explained that "we talk to each other a lot here, that is the big advantage of having a small municipality, we communicate well" (B4). ULM can potentially build on this comparative advantaged and develop CC adaptation measures in a collaborative manner from the outset (assuming that ULM commences with adaptation actions in the near future). Municipal size and capacity also appear to influence municipal perceptions of responsibility for GEC actions. eThekwini officials strongly recognised local government's role and responsibilities for GEC adaptation and appeared to hold notable confidence in local level capabilities and capacities for CC policy and action, independent of national and provincial support and action.

Conversely, Ugu and Umdoni representatives appeared to be more defensive of their approach to CC, highlighting their reliance on higher government tiers for supporting and guiding their GEC/CC response and the need for policy directives to encourage local CC responses. For example, in response to a question on constraints to municipal adaptation action, B1 explained that, "the reality is that municipalities must have someone, like the provincial government, to get them going, telling them why and how they are supposed to do these things". The politics and construction of scale is thus central to understanding the governance of GEC/CC (Adger, 2001; Lebel et al, 2005; Bulkeley, 2006).

The above discussion has focused largely on operational and institutional constraints and facilitators of municipal adaptation. The following sections point to the significance of fundamental political-economic influences, structural constraints and deep rooted historical and political aspects that need to be addressed for effective municipal adaptation and to root out the causes of GEC vulnerabilities.

5.6 Political economies of GEC/CC adaptation

5.6.1 Trade offs – 'environment versus development' and conflicting priorities between multiple players

Although environmental issues have grown in prominence in the post-apartheid context, a principal message derived from key informant interviews is the struggle to address environmental problems and GEC within a broader context where environmental issues are still somewhat underplayed and viewed by many government officials (including senior representatives and politicians) and the general public as a barrier or trade-off rather than a co-dependent aspect of development (see Chapter 3 for background to this debate). Indeed, very significantly, *every* municipal informant and most external key informants emphasised this issue in some way, often underlining that such polarised views are a major challenge to achieving both environmental and development goals in the SA context. In many ways, attempts to integrate CC concerns into developmental and socio-cultural systems have illuminated the deep-seated tensions between development and environment agendas, and nature-society relations in the SA context and more broadly (Bulkeley, 2000; Hilhorst and Bankoff, 2004a; Heyd and Brooks, 2009; Simon, 2011).

In addition to the overarching 'seperability doctrine' (see Chapter 2), racial and cultural tensions linked to environmental protection reinforce dualistic understandings of development and environment issues (Scott and Oelofse, 2009; Leck et al, 2011). Colonial and apartheid governments imposed widespread and devastating land and livelihood losses on African populations, through 'environmentally racist' actions such as forced removals in favour of 'nature conservation' (Khan, 2002; McDonald, 2002; Patel, 2010). As a result, inevitably widespread extensive environmental scepticism surfaced. These destructive experiences have been communicated between generations and the associated injustices are firmly embedded in cultural memories. As such, poor and marginalised populations often continue to view environment related actions as benefiting a small privileged minority. Indeed, the divisive 'environment versus development' discourse or myth appears to be gaining further momentum in the current order where addressing GEC/CC adaptation is often bagged as an environmental protection or conservation issue and thus inhibits effective GEC adaptive capacity and responses.

The following excerpts from a key informant interview in Ugu (B6) neatly capture the above issues:

> I can tell you that for most people in this district development comes first! The environment is either a nature conservation issue or it is a development impediment mechanism.

It is worth quoting the interviewee's explanation outlined later in the interview at length to capture the historical and political influences underpinning these viewpoints. This quote is captured in Box 4 below.

Box 4: Interview excerpt from interview B6

Statement by Ugu municipality representative (B6):
I think the thing with black people is that they see it as the white people, they wanted to remove people to protect the environment and to also put animals in their place, forcibly done so at that time of land dispossession. Well, that is how they see it anyway, and white people are very close to their animals and that. But for us black people, we cannot understand why we must be moved to protect animals and trees. You and I we see things differently. You see that is how nature conservation and environmental management was introduced to us, it was this thing that was going to remove blacks out of their land and put animals and plants. So now with climate change if they say why do you do that? Then you say, 'it's because I want to manage the environment' and telling those same people environment, environment, in a different way for this climate change thing; no, of course it's not going to work with them. And secondly, developments: when they are being proposed, people get told we are building this shopping centre, it's going to create jobs and improve their lives but then comes along this thing called an EIA and they are told actually the development is not going ahead. The people ask why and they are told its cause of environment things. So now, you see to those people who wanted the development the EIA is just an impeding factor, immediately people think this thing of the environment is against them. So that is the big issue with this climate change stuff, if our people see it mainly as protecting the environment we have a problem

This quote clearly reveals the complexity of addressing environmental issues within the culturally heterogeneous SA context, characterised by diverse framings and attitudes towards the environment. These framings are shaped through, *inter alia,* cultural, racial and justice lenses. These complexities amplify the existing challenges of implementing GEC/CC policies in already socio-economically and environmentally stressed contexts.

Evidently, these dilemmas are particularly pronounced at the local government level where the need to prioritise environmental concerns and the concurrent need to boost development to provide basic needs and service requirements create considerable tensions, as my empirical findings strongly attest, as well as linked literature (Patel, 2008; Roberts, 2008; Carmin et al, 2009). Furthermore, "local governments operate within a regulatory framework that reinforces the dualistic 'development-plus-impact-assessment' paradigm" (Swilling, 2008: 103). Such dualist outlooks hamper both appropriate environmental and developmental progress. Roberts (2008) confirms that

this tension has never been overcome effectively in Durban, and has perhaps deepened as development challenges steadily increase in the city.

As A7 explained in detail:

> In terms of cultural issues and climate change, there is the issue with people seeing the environment as this kind of white elitist view. Then there is like the more developmental view that maybe shows awareness of the environment, but doesn't feature in relation to development aspects. This view is very strong, definitely, even within the municipality certain individuals hold this viewpoint. The environment has a very bad legacy here and it needs to change but how?....it is very tough. The city has so many demands, if environment is prioritized over development; well if that is how people see it anyway, then we are going to move backwards and climate change will be consumed by that too.

These tensions were particularly prominent in the poorer and under-resourced Ugu/ULM context.

Municipalities are under significant pressure to fulfil their developmental role and if addressing environmental issues (including GEC) are viewed as 'add ons' or largely 'green', anti-development or potentially divisive issues, they are likely to be deprioritised. As exemplified in Chapter 2, it has been widely noted (e.g. Adger et al, 2003; Parnell et al, 2007; Scott and Oelofse, 2009; Simon, 2011) that environment concerns are often viewed as a luxury and in conflict with critical development priorities in contexts such as the Southern African Development Community (SADC) region where development is still focused on addressing poverty and meeting basic needs. While this is a widespread phenomenon, it is particularly pronounced in the SA context because of distinctive destructive and discriminatory apartheid era policies and practices. Of primary concern is that the long history of racially and politically based environmental marginalisation may result in elevated GEC vulnerabilities for marginalised populations who may be reluctant to engage in GEC measures.

The existence of the divisive discourse is broadly recognised, yet its impact on GEC actions and adaptive capacities does not appear to be adequately accounted for in powerful quarters and in policy development. While there is certainly evidence of growing government attempts at bridging the environment – development divide (e.g. 'Working for Ecosystems'[62] programme and eco-schools projects), these occur within

[62] Initiated by eThekwini municipality with funding from DEAT, this programme promotes mutually beneficial relations between local communities and their environment (e.g. employment in managing environmentally sensitive areas).

the current neoliberal political-economic context, where the pro-growth and pro-poor agenda has, to date, been pursued through large-scale development that emphasises maximization of natural, economic and social resources (Leck et al, 2011). This approach divides environment and development issues through framing them as competing issues. Further, instead of encouraging a democratic resolution between interconnected environment and development agendas, government and the media are sometimes guilty of further entrenching the divide. For example, a local newspaper in the Ugu/ULM region published a report titled 'Enviro issues delay work' alleges that relocation of flood victims to new housing was being delayed due to 'environmental issues', which engineers are addressing (Govender, 2010) (see Appendix VIII). This is an example of the application of government's weak EM approach where managerialist and expert driven approaches to environmental management are promoted and development and environmental issues often polarised. Moreover, in line with the rubric of EM, the local government has avoided addressing the underlying causes of vulnerability to flooding amongst these flood victims who are living in poorly planned government housing, built on a flood plain (see also Section 8.10).

Widespread re-conceptualisation of the environment and development agendas as being interdependent needs to be facilitated through, for example, adaptation measures that support livelihood opportunities and the rights of the poor and marginalised. Fundamentally, holistic approaches to GEC adaptation need to show how environmental management and protection underpin the quality of life, and indeed survival, of the poor (Leck et al, 2011). Many suggest embedding or mainstreaming GEC/CC actions (see Chapter 3 for overview discussion) into existing development and governance systems, particularly in 'developing' contexts characterised by urgent development needs as a way of ensuring that CC is addressed (e.g. Parnell et al, 2007; Huq and Reid, 2009; Sharma and Tomar, 2010). However, as a caveat, I discovered through engaging with practitioners that despite being potentially effective in many ways, meaningful mainstreaming is very difficult to achieve in practice (A3, A4, A9, C1, C5). The main point expressed was that the all-encompassing nature of GEC creates major institutional and operational complexities. As A8 explained,

> Climate change cross-cuts or intersects virtually every single issue within a municipality. So to start to unpick this conglomeration and to get orderliness and structure into the process called dealing with climate change or mainstreaming, as our municipality likes to promote, is one hell of an undertaking.

This empirical finding raises important questions about the practicability of the common message regarding the necessity of mainstreaming noted above. Furthermore, in order for mainstreaming to be effective, key decision-makers and politicians need to begin to comprehend and promote CC as an issue that fundamentally affects and is inseparable from development, not simply a stand-alone environmental issue. However, a principal obstacle to this is that, "sustainable development is still regarded as a trade-off between environment and economic development priorities in SA in some powerful quarters" (Patel, 2008: 357). As A1 confirmed, "mainstreaming has proven difficult because it is not yet seen as a development issue nor is it a priority amongst the majority of our politicians". I revisit the mainstreaming debate in Chapter 8, where I argue for the concurrent need to transform existing development agendas to enhance long-term adaptation and emphasise the salience of an 'ecological approach' to environmental justice, rather than a weak EM or individual human rights approach to prevent antagonisms to environmental agendas from deepening in the context of GEC/CC (see Chapter 2).

5.6.2 The roles of politics and economics: competing priorities and agendas

Significantly, most (13/15 or 87%) municipal officials, as well as several consultants, believed that dominant political agendas and the politicians driving them play a very influential role in shaping the GEC agenda, particularly at the municipal scale (see Chapter 6 for further analysis regarding multi-level GEC governance). In addition to the above dichotomous thinking, most interviewees raised various concerns about perceptions and attitudes towards GEC/CC held by many political figures. Tellingly, A8 explained, " we are still up against the argument, is climate change really an issue? That still exists in this day and age, especially among our political authorities. So you know there is a knock on effect of that further down the line at community levels". A11 further attests:

> Politicians are *the* senior overarching aspect in the climate change web and until such time as our important political figures and officials with senior political clout that are not entirely convinced that climate change is going to have the effects that are predicted *do believe*, it will be a problem. And, to a certain extent the occurrences right now that indicate that climate change *is here* are being ignored or swept under the carpet.

Additionally, environmental issues are often viewed through racial lenses by officials; this appears to reinforce dualistic perceptions at various scales. A7 explained that,

> A real problem we have with implementing environmental based programmes is that politicians often don't support these because they say they are not inclusive of all races and that they are representative of past ideas and agendas. So really, most things come down to politics and political support for these agendas, which is not really coming through.

These claims are supported in wider SA-based literature where, for instance, it has been claimed that officials and politicians often refer to environmental discourses as 'white, racist anti-development' discourses (e.g. Barnett and Scott, 2007; Scott and Oelofse, 2009). Additionally, some interviewees expressed skepticism saying that politicians who do support CC and environmental agendas often have ulterior political motives and are not necessarily genuinely committed to addressing GEC/CC: "The mayor is a bit of a joke really, he supports the climate change stuff, sure, but for him it is more about the publicity than anything else I think" (A10). The issue of key figures and departments using the CC agenda as a political tool and marketing strategy is discussed further in Chapter 6.

Several informants also explained that, in their struggle to deliver development and visible results, frequently with the aim of securing votes (A5, A9, A10, B1), decision-makers often overlook important adaptation needs,

> The political focus is shifting more and more. No politician puts money underground where you can't see it; that is where we need it though. They would rather build a clinic that is not even used than put underground furniture in place. They want that publicity, to be seen to be doing something, but our underground furniture is old and shaky and needs to be adapted.
> (A9).

Reiterating these sentiments, Breetzke (2009: 5) explains that the provision of services and social facilities "represent the re-election 'ticket' for most political representatives". A9's phrases 'underground furniture' and investing 'money underground' refer to the installation and maintenance of critical urban and rural physical infrastructure such as water pipes, storm water drainage, sewerage and energy systems, telecommunications and foundations that are not readily 'visible' in the same way as housing and other developmental projects are, yet are essential foundations for GEC adaptation and sustainable development. Maintenance, as well as transformation of this infrastructure to suit changing climatic conditions is essential for GEC adaptation, yet is often taken for granted (Bulkeley, 2010).

In addition, economic priorities, short-term planning outlooks and cost effectiveness were identified as central factors influencing politicians' and senior decision makers' actions and by extension creating core barriers to GEC adaptation at the municipal-level. eThekwini key informants (A4 and A11) explained in a joint interview, captured in Box 5 below:

Box 5: Excerpt from A4 and A11 joint interview

> **A4:** If you are going to put money and people behind anything, politicians and administration want to put that behind traditional development streams so they can produce housing and roads to those houses and electricity and so on. Anything that endangers that is problematic.
> **A11**: Ja, and obviously in the long-term adaptation is effective but its the immediate where most concerns are…
> **A4:** you know, if a house that is weather proof is say R10 000 and a normal subsidised house is R2000 the fact of the matter is that someone still has to find that R8000 in between.
> **A11:** where's that going to come from?
> **A4:** The available money is obviously going to go ultimately to the R2000 where the most development can be delivered to the most people.

The exchange represented in Box 5 underlines a significant conundrum that even if politicians and key decision-makers do recognise the importance of GEC adaptation, the extreme pressure to deliver housing and services to a large population in a cost-effective manner may outweigh this concern since adaptive technologies and infrastructure inevitably add costs to limited budgets. The major concern is that such developments are missed opportunities that will inevitably require retrofitting and as opposed to supporting household adaptation may actually increase vulnerabilities to GEC and adaptation costs.

These issues were emphasised even more strongly in the Ugu context. Several Ugu informants (C2, F6, F1, G1, G2) expressed concern that opportunities for adaptive reconstruction of key infrastructure and housing and appropriate long-term planning following recent extreme weather events had not been seized, even when funded opportunities arose:

> That tidal surge of 2007, floods of 2008, have been, as horrific as they were, they were great eye openers to the municipality and to others as to why we as environmental affairs are here. Some have said now that they recognise actually you cant just develop anywhere, that you need to rethink. But again,

> unfortunately, its money; budget in municipalities still speaks more than clever planning. For example, we did have cases where we just had a road wash away and key infrastructure. You know it is going to wash away again, but because you want to save time and get things running again you don't want to go through the process of finding a more appropriate place; you just build it straight back there, even though they were given state funds for so called appropriate reconstruction (F1).

The above issues notwithstanding, with increased awareness, the costs of not adapting key municipal infrastructure, services and housing could also be a catalyst for action, particularly among politicians (Agrawala and Fankhauser, 2008). From this viewpoint, A5 explained,

> The economics of it is going to be so huge. I think government is probably waking up to that and will soon realise it is not just a pie in the sky but that it has massive economic implications and that is what drives politicians. They also need votes to stay in power and if you have a population that is starving with no water you have a problem. Also, with tools such as carbon credits, the city can generate finances from that and when officials start to realise these issues more climate change actions will likely take off.

The massive financial implications of not adapting and mitigating CC/GEC have been widely documented (e.g. Stern, 2007; Simon, 2007; Agrawala and Frankhauser, 2008).

Alongside pro-poor agendas, senior decision-makers from Ugu and eThekwini have also been accused of recently supporting contentious pro-growth developments, which have raised doubts about the authenticity of local government's GEC adaptation commitments. These issues were most prominent in Durban, which has been the site of much recent large-scale development such as the King Shaka airport and Dube trade port (without rail links and sufficient public transport to the city) and proposed developments such as the massive harbour expansion, digging into the old Durban airport site on the KZN south coast. Returning to the Golden Mile promenade example, F6 contested,

> I just get the idea that politics overrides the environment. I certainly know in Durban; look at that beachfront promenade, that EIA was shocking, absolutely shocking in terms of public participations….WESSA's attitude was that we really would be wasting time and effort appealing it.
> HL: Why? Do you mean because the city wanted it to go ahead?
> F6: Well, not the actual staff like from the various departments; they would be against those developments….. probably, but their voices aren't heard against the politicians; they want these things to go ahead for revenue purposes.

Several interviewees from my local case study areas held views similar to a gentleman from Amanzimtoti: "It's like with that beachfront promenade, everyone knows it is

inappropriate but all you have to do in this city is think of a development that tourists will like and will make money, put it to the city and it will go ahead. With politicians, money is always going to count" (I25).

Akin to most neoliberal contexts, the private sector, particularly developers, have a significant influence on municipal agendas and shaping rural and urban spaces (ASSAf). As a senior planner (A6) from eThekwini explained:

> We were just fighting the Dube trade port; there was a lot of opposition to that from this department and others but obviously we had no say at the end of the day. For those types of development there has been such a lot of political pressure and together with Tongaat Hulett, which also has an awful amount of power in the city; far more than they actually should, especially in the north. So you know, we try but we come up against that a lot. Then our planning inputs are not really considered.

Thus, strategic relations between politicians and developers are a powerful force in shaping municipal contexts. Municipal officials and consultants often expressed concern that many developers, as well as industry, do not yet adequately account for environmental and GEC issues in general. Given the extent of private and industrial development in both municipalities, this is a key barrier to broader municipal adaptation. Financial priorities combined with lack of enforcement and regulation appear to be overriding factors for developers concerning CC inaction and apathy; "you get developers who really just don't seem to have a genuine interest or concern about it, they are really in it for profit and that's it, particularly the bigger developers" (A5). Additionally, "actually developers do see it very much as a paperwork exercise still" (A6) and "there is still an attitude with developers, well now I've paid my money, I've got my authority and now I am going to get on with it. The environmental management plan is not there to be looked at again and that is a huge problem and enforcement by DEA is non-existent. Once again the environment is sidelined" (F1). Other officials (e.g. A4, A5, A6, A7, C5, E3, A10) noted that more education and information provision were necessary for developers and businesses to assist in adaptation at these levels. Municipal officials feel limited in their ability to advance adaptation measures in this context of conflicting agendas and actions embedded in the confluence of strategic relationships between influential developers, industry and politics.

Clearly, there are very complex and conflicting political-economic interests and dynamics at play that pose significant barriers for municipalities to pursue adaptation

measures. While all government officials interviewed supported the need for adaptation, most felt that politicians and political agendas are currently hampering CC adaptation initiatives from advancing to the scale and extent required. While officials were relatively optimistic about municipal adaptive capacities and adaptation possibilities, it was evident that many felt that municipal GEC actions would be limited by fundamental structural and political-economic influences, which are not being concurrently adapted and revised to adequate degrees. For instance, inadequate investment in public transport infrastructure, continued urban sprawl, lack of investment in critical infrastructure (e.g. water pipes and drainage) combined with macro-level issues such as continued investment in coal-fired energy and inadequate national investment in renewable energy were all cited as major barriers to municipal-level adaptation efforts.

Linked to the above point regarding the noted requirement for increased CC education within the private sector, the importance of education and awareness raising *within* municipal bodies and amongst the general population emerged as a key theme influencing municipal adaptation initiatives. The following section explores these issues at length.

5.7 Awareness raising and education amongst government institutions

Informants observed that understanding about CC/GEC and adaptation measures amid government officials and the broader public needs to be enhanced in order for GEC adaptation to progress. As such, the importance of increased CC education for overcoming potential barriers and facilitating institutionalisation, greater uptake of CC initiatives and enhancing public support and adaptive capacities was strongly emphasised. As A11 explained with regard to the importance of internal municipal education,

> Climate change is a new issue for us, as practitioners we are having to educate ourselves via the internet in terms of the subject because there is little within local government; there is little education. We need to demand that we be better educated about these issues, we need to know how to adapt, from fire services to health.

Informants also stressed that although certain educational initiatives were being launched for the benefit of municipal employees (e.g. MILE's 'master classes' on key issues such as waste management), municipalities need to play a more active role in

internal CC education. Ugu and ULM municipal representatives responded strongly that they lack concrete and comprehensive data on the likely local consequences of GEC/CC and were often uncertain about what types of adaptation were necessary. Also, several respondents did not appear to understand the difference between mitigation and adaptation. As an Ugu environmental representative iterated, "we are just not at that level, like eThekwini; we are not at that point of understanding what exactly climate change is and how we must deal with it, it is complex"[63] (B6).

Most (13/15) officials believed that the general populace are quite well *aware* of GEC/CC, yet there is widespread lack of understanding about the causes, likely local implications and options for adaptation and mitigation. My empirical survey and community level interview data reiterate these concerns, to a certain degree (see Chapter 7). This lack of understanding forms a barrier to municipal and community-level adaptation because if the causes and threats of CC are not well understood it is unlikely that proactive protective and preventative adaptations will be implemented at household-scales or supported thereby possibly undermining adaptive capacities.

Both the Ugu and eThekwini municipalities recognise the need for community education on GEC. Indeed, eThekwini has been a catalyst in implementing eco-schools projects and have hosted a number of public education initiatives (e.g. public climate change meetings and conferences). Ugu municipality is encouraging environmental awareness campaigns in local schools, as well as engaging in educational drives with councillors, traditional leaders and businesses (B3, B7, C5). Despite these efforts, GEC/CC education, particularly for poorer, rural communities is evidently not a government priority as yet and urgently needs to be initiated on greater scale. While there have been various educational initiatives within poor and rural areas (such as eThekwini's using theatre for CC communication initiative), the city's focus has been hitherto predominantly on middle- to upper-income residents, and on knowledge that has been produced regarding appropriate adaptation responses for these household types (Schiermeyer, 2011). In both municipal contexts the knowledge required for adaptation at the low-income and informal level has not been produced for public distribution or communicated in appropriate manners as yet (Leck et al, 2011). For example, much of

[63] This point suggests the potential benefit of inter-municipal collaboration in terms of sharing information and experience and thereby addressing divergences in municipal adaptive capacities.

eThekwini's public communication and awareness raising campaigns in the form of conferences, information brochures and website sources appear to be targeted at middle- to high-income English-speaking groups, whereas the majority of the population is poor and speak diverse languages, mainly Zulu (Scott et al, 2011).

Importantly, in both municipalities, the most vulnerable in terms of location (e.g. Ghandinagar floodplain residents) and other key indicators such as age and low income, showed the least understanding of likely CC implications. These vulnerable individuals and households need to be prioritised in education campaigns. The relative ineffectiveness of local government efforts at municipal-wide CC education and awareness raising is also evidenced in the fact that many (46%) of survey and in-depth interview respondents were unaware of municipal CC-specific or environmental initiatives. Those who were aware expressed considerable scepticism and dissatisfaction at these efforts (see Chapter 8 for further analysis). Many survey respondents emphasised the need for CC education within communities and showed eagerness to learn. Municipal representatives from Ugu and Umdoni expressed the desire to implement more community education, yet felt limited by financial and capacity constraints in comparison to eThekwini, "they are well capacitated for that, they have a whole division dedicated to that" (B4).

In addition to inadequate GEC education, some officials felt that certain public attitudes and mindsets towards GEC posed a potential barrier to support for municipal and household adaptation. Government policy discourses in SA, and more broadly, concerning information provision to the public about the need to respond to CC are predominantly based on the rationalist 'information deficit model' or 'public deficit' model (Leck et al, 2011; Bulkeley, 2000; Norgaard, 2011). The assumption underpinning this model is that the lack of citizen engagement around environmental issues, such as adapting to CC, is caused by a lack of information (Irwin, 2001). Thus with improved understanding about the science behind policy to fill this supposed information gap, for example, the public will act accordingly (Smith and Pangasapa, 2008). However, the relationship between knowledge or understanding and action does not always manifest in practice. This can be attributed to various reasons; a principal factor being that attitudes and mindsets, which shape behaviour and actions are not readily shifted simply through the attainment of increased information.

Finger (1994), claims that well-resourced people are often highly aware of environmental issues, but may not act on this knowledge. One official (A2) offered an explanation for this:

> A lot of people would not compromise and think 'oh well, I'd rather have that flat-screen TV than put a solar panel on the roof'. I think at the moment a lot of people have had it so good for so long they don't want to acknowledge their role; they do not want to adapt their ways for climate change because it will cost more, which will mean that our lifestyles will have to drop, no-one wants that! It is a slow process, ultimately we need attitudes to shift but that takes time.

Owens and Driffil (2008: 4413) maintain that, "attitudes themselves are influenced by a variety of social, political and cultural factors aside from information provision".
While it is important not to generalise and to recognise the multitude of macro and micro influences on attitudes and actions, my empirical data support A2's claim as several high-income households (e.g. I24, I36, I39) with in-depth understandings of CC often showed reluctance to change their high consumption lifestyles, which they have come to value, preferring rather to continue with business as usual. This analysis of high-income citizens' GEC responses raises the issue of the differences between the poor and high-income households and how adaptation in each group reflects and reveals their socio-economic structures. This is addressed further in Chapter 8.

However, it is not only the process of education that is important (analysis of educational and CC information issues is returned to in Chapter 7). The nature and type of knowledge produced and an understanding of which actors hold the power in knowledge production is also critical to understanding the social barriers and opportunities for adaptation. Moreover, the way in which CC information is communicated is also a crucial consideration. These important issues are now discussed.

5.8 Multiple framings, diverse knowledge systems and the centrality of cultural influences

My empirical data reveal the centrality of the multiple cultural lenses through which diverse communities and government officials perceive and respond to GEC (see Chapter 7). However, this has been inadequately accounted for in municipal and broader educational and policy initiatives discussed above, where locally constructed environmental knowledge is somewhat sidelined.

The application of political ecology (PE) as an analytical framework enhances the potential for CC adaptation strategies to account for and be informed by locally constructed environmental knowledge and explanations, which is of pivotal importance, particularly for the most vulnerable populations. By emphasising the importance of rethinking knowledge, PE could facilitate a restructuring of environmental understanding and politics. This would be a "more positive and interventionist approach to environment and social justice than classical positions", which would be of central importance to CC adaptation plans (Forsyth, 2008: 762). PE can provide insights into social/environmental justice and equality concerns regarding the development and implementation of knowledge for adaptation plans.

Magistro and Roncoli (2001) assert that cultural perspectives shape how ordinary citizens receive new information about CC and also how they trust the information and the experts producing the information. They propose that objective scientific accounts of CC need to be complemented with interpretive frames of knowledge, which include indigenous knowledge. B6 noted the importance of recognizing the plurality of knowledges around the issue of CC:

> There are a lot of these things in place already, like planting trees as wind breaks, it's an old African tradition. Now, all of a sudden it's seen to be a white man's thing. Actually, people have always known when the chief allocates land the only way to protect your land is to plant trees around until you are ready to build. So the thing is people *do* understand these adaptation issues but now all of a sudden it's been called something in English, for which the Zulu or traditional word is not the same. And the practice is made to be something that is foreign and we think our old ways are not right anymore.

This synopsis is particularly relevant in developing countries, where multiple knowledge and value systems co-exist with other information sources, which inform individual practices in relation to the environment (see Chapter 7).

B5 explained the pervasive influence of cultural or traditional beliefs on GEC/CC action, held by many societal actors, including high-level officials:

> We have tried a lot with this climate change education in the municipality but there are many issues to consider. I'll give you an example of traditional beliefs: we had the Minister of Transport here, we were launching some new infrastructure and then he referred to the tsunami and said, 'we need to go back to our roots, these things are happening because our ancestors are angry with us. He says, 'we need to appease our ancestors, we need to sacrifice some goats and then the problem will go away'. But we can't just ask the ancestors to come down, no one will be left! You know, I have no issue with these traditional beliefs but its difficult to balance all these things; its a sensitive issue.

These publicly expressed attitudes serve to reinforce similar beliefs held by local populations as discussed in Chapter 7. I argue that while it is a challenging prospect accounting for culturally-informed belief systems in municipal and indeed all government educational initiatives and GEC policy is crucial if they are to be effective. As Swidler (1986) explains, our cultural toolkits are comprised of multiple and sometimes conflicting symbols, stories and guides to action that individuals draw on in various ways in developing understandings and actions. Our understandings of issues are based on multiple knowledge bases built from various sources such as media, cultural influences and formal schooling. Cultural beliefs therefore require consideration in the development of GEC/CC initiatives, while simultaneously encouraging citizens to incorporate new co-existing understandings of GEC and adaptation options into their cultural frameworks to enhance adaptive capacities. The role of culture emerged as a very strong theme in this research and is thus further analysed in Chapter 7 with regard to local citizen responses to GEC.

Importantly, transmission of information needs to be sensitive to interlinked social and cultural influences. For instance, the term CC has created confusion among Zulu-speaking people and is widely noted as a 'white people's' term as there is no direct translation in the Zulu language (B6). This terminological confusion has emerged as a possible barrier to adaptation in the broader municipal context and beyond, as explained by an Ugu municipal official (B6):

> The thing is that it is only the English language that has managed to capture this concept of climate change; in Zulu both weather and climate are one and the same thing. So if you are saying climate change it is as good as saying weather change. So we need to be able to say this is what climate change means in Zulu so we don't go to people and say the climate is changing and you need to be concerned; they will tell you the climate changes every day

In support of the above arguments, Moser and Dilling (2007) explicate that, to be successful, communication and interaction about CC must consider the specifics of the receiver of the information and potential communicative obstacles (e.g. language and cultural differences). They also stress that establishing a rapport and effective interchange between the receiver and the transmitter of information is important for knowledge sharing and transmission to be effective (Moser and Dilling, 2007). This can be achieved only if important issues such as cultural beliefs and local environmental traditions and practices are understood.

Certain officials, particularly in the Ugu context, underlined the pivotal role of traditional leaders or *Amakosi* in shaping responses and adaptive capacities to GEC amongst communities under traditional leadership and in shaping the outcome of municipal adaptation initiatives. Chapter 3 outlined that, in addition to politicians, traditional leaders are vital actors within the SA co-operative governance system and retain a strong influence over vast African communities and rural land.

Communities are more likely to accept GEC/CC information and proposed strategies from traditional leaders with shared cultural beliefs and values than from outsiders. As an Ugu municipal official cogently explained:

> We need to start with community groups, ward councillors, *nkosis*, people listen to them better. We need to inform these guys of these issues so that they can communicate, they are the ambassadors, the ones that the community trusts. So it means that if we communicate climate change issues with them they will go around and communicate and the word will spread (B7).

Traditional leaders need to be involved in adaptation decision-making processes from the outset if adaptation measures are to be accepted and successfully implemented in the areas over which they preside (see also Section 3.10). However, to date, such involvement appears to have been somewhat inadequate, as an *Nkosi* (D1) explained, "We traditional chiefs are still learning. We don't understand this climate change thing

properly. That is why we need to be invited and attend these meetings they seem to be having about it".

At the various municipal- and provincial-led CC events I attended in the study areas during my fieldwork period, *Nkosis* appeared to be largely absent, although, their key role was highlighted at the KwaNaloga conference. Encouragingly, several representatives explained that there are recent increasing attempts to engage *Nkosi's* on municipal CC agendas and have been invited to pre-COP 17 meetings and other educational initiatives. Caution was expressed though, with some warning that "these things will take time to for *Amakosi* to accept" (F2) and "although we are engaging with them, I am not so sure that we are winning" (A8). As stated, the often somewhat conflict-ridden relations and power struggles between local government and traditional leaders poses a potential barrier to municipal adaptation efforts.

The following quote sums up the need for increased engagement between municipal authorities and *Amakosi* over key developments, the need for culturally sensitive CC education and the power of *Amakosi* in shaping rural landscapes; consequently influencing adaptive capacities of individuals and SES:

> Personally, I think the traditional leadership needs a lot of capacitation; their ignorance is vast. If you want to develop land in rural areas, you need to go to the *Amakosi*. He will gleefully give you his wetland for you to build. Even a place of high biodiversity can easily be given because he doesn't know or care of these things. The important thing here is that in these areas, the culture says you are not allowed to question the wisdom or actions of the *Amakosi* so he has got this position, he is regarded as a God. When he takes these actions who are you to question what he is doing, his authority?

While the reference to the alleged ignorance and lack of capacity of traditional leaders represents a biased generalisation, other officials echoed similar concerns regarding negative environmental implications of many traditional leaders' environmental decision-making and actions.

From the above discussions it is evident that municipalities need to improve the participatory culture of their CC and environmental efforts more generally and develop effective and locally tailored communication tools that use comprehensible language and are sensitive to cultural and social influences. However, as the following section shows, municipal − public relations are often tense and conflict ridden, thereby posing

obstacles to effective communication and partnering.

5.9 Municipal – public relations

While the ruling ANC party has repeatedly won the overwhelming majority of votes in post-1994 local elections, there is much contention and frustration over political and municipal performance on service delivery and other core functions devolved to the local level under neoliberal agendas embraced by the state. My survey and interview data reveal that municipal − public relationships are often very tense, with many local stakeholders from all socio-economic and cultural backgrounds showing animosity and airing frustrations and grievances over municipal government performance (see Chapter 8). Such tensions may have negative implications for local efforts to adapt to climate variability and change, particularly efforts that require co-ordination between municipal and local community levels. Stakeholders commonly observed that attitudes of municipal officials and local citizens, as well as relationships between local citizens and municipal organisations, require adjustment for the successful implementation of GEC measures. From the municipal viewpoint, officials outlined various reasons for widespread dysfunctional relationships between the municipality and public stakeholders.

Several officials alluded to the difficulties of addressing GEC in the context of municipal spaces characterised by steep socio-economic gradients, where balancing the interests and priorities of socially diverse municipal populations poses considerable obstacles. As supported by my research findings presented in Chapter 7, this diversity leads to vastly different trends in terms of responses and attitudes towards CC. These are defined by differences in livelihood priorities, access to information, education, social and cultural dynamics and expectations. In recognition of the challenges posed by diverse socio-economic contexts, F1 argued

> A lot of the affluent people, they will say, 'yes, I agree the environment needs to be protected, but not here on my property'. They don't want to live adaptive ways and use eco-toilets and save water and that. Then we have the poorer communities who are reluctant to take actions because of different reasons, especially that environmental concerns do not feature high on their livelihood lists.

The complexities of municipal and community-level adaptation in the context of vastly different socio-economic contexts and livelihood priorities is examined in detail in Chapter 8. Here, it is sufficient to record that these issues pose significant challenges to

municipal adaptation initiatives.

Regarding the final key theme, local officials expressed concern about the lack of emphasis and willingness amongst local populations to form municipal − public partnerships in GEC adaptation and a tendency to emphasise municipal responsibility for GEC adaptation. As A5 attests,

> I think another big challenge we found was that ratepayers see climate change as a problem that government must solve. They are almost waiting for a directive from government to say, 'ok now this is what we are going to do and you guys must comply'. In some respects they are correct, for guidance, government should be setting those policies and strategies in place but there is a role for the public in lobbying government. Government must take the lead, but if they are not doing that the public still have a role to play in pushing them.

In support of A5's claims, 39% of survey respondents felt that it is the government's responsibility to address GEC/CC. However, the important role of the public in lobbying politicians and local government to act on CC was not well recognised among local research participants.

Several Ugu representatives shared similar sentiments and argued that municipal − public relations were weak and often conflict ridden, which hampers collective efforts. Some officials were quite defensive of their roles and performance: "The problem is that people play down the municipality. We get frustrated because we do a lot with no recognition; it is demoralising. No matter what we do, it is still not good enough" (B2). Other officials shifted the blame for environmental problems within the municipal area, through criticising individual behaviour rather than the broader structural conditions and constraints that shape people's actions and livelihood opportunities: "there have just been generations of bad practice; you know its not the municipality, it is the local people, they have this very backward thinking. The bad practices like washing in the river in Umzinto have severely affected the main rivers" (B4). These examples highlight the underlying tensions that influence adaptive capacities of both municipalities and local households and communities. Municipal − public relations were particularly tense in ULM, where stakeholders expressed pointed animosity towards local government citing corruption, mismanagement and inadequacy as defining characteristics of local government. The reasons for these local citizen viewpoints become clearer in Chapter 8 where the local case study findings are presented.

A few municipal officials noted the potential facilitatory role of NGO and civil society organisations in fostering more positive municipal − public links and joint GEC adaptation initiatives (A1, A3 A6, A7, B7). Bulkeley et al (2009: 16) explain that, in addition to relations with higher government spheres, municipal competencies for responding to GEC/CC are partially dependent on relations with other partners such as civil society. Drawing on Satterthwaite's (2008) argument, the authors underline the importance of local governments' ability to create a supportive environment for civil society action to foster effective relations with such partners. However, at the time of interviewing, a prominent official described Durban-based environmental NGOs as "relatively disempowered" and explained "I hype them up in meetings but its mostly just hot air. If I tried to rally them all together, it would be a handful if I am lucky and most would be from my own department" (A1). Other stakeholders noted that it was perhaps the approach adopted by certain NGOs that prevents effective collaboration noting issues such as "SDCEA (South Durban Community Environmental Alliance) will protest about just about anything" (A5) and "we have had a few run ins with the people from SDCEA. They are very radical and confrontational. They need to find a balance or some sort of compromise" (C2).

However, viewed in a different light, the apparent often confrontational and conflict ridden nature of relations between civil society (including NGOs) and local governments could be a potential driving force for transformation. To reiterate deliberative governance arguments outlined in Chapter 2, Aylett (2010: 10) contends that "conflict is not only unavoidable, but also a legitimate and potentially beneficial form of participation" and, in a balanced manner, protest and participation support and sustain one another. As a key theme, municipal − public relations are analysed further in Chapter 6 and 8.

5.10 Summary and Conclusions

This chapter has addressed the first research question through examining Ugu (including ULM) and eThekwini municipalities' responses to GEC/CC, with a particular emphasis on the drivers and constraints to adaptation within these contexts. Different types of constraints and facilitators are evident in the municipal case studies, with certain issues being more prominent within a specific municipality. The different constraints and drivers to municipal adaptation are shaped by fundamental structural,

operation and institutional factors. The structural political-economic influences are evidently more difficult for local municipalities to address as other comparative studies have found (e.g. Gore and Robinson, 2005; Bulkeley and Betsill, 2003; ASSAf, 2011; Scott et al, 2011).

As shown in this chapter, rural and under-capacitated Ugu/ULM municipality lags behind eThekwini in its CC responses, which is likely to have significant adverse implications for local populations (addressed further in Chapter 8). I argue that Ugu/ULM can potentially strengthen their CC response through increased collaboration with eThekwini municipality and at the same time, eThekwini can learn from Ugu/ULM's experience and insight. This fundamental and under-researched issue is a central topic addressed in the following chapter. This chapter has contributed novel insights into municipal drivers and constraints to adaptation through empirical analysis and, while other noted issues have been documented more widely, I have shown how they manifest in specific ways in the respective municipal contexts. This chapter provides a basis for the proceeding chapter, which investigates horizontal and vertical government relations and the likely effect of collaboration or lack thereof on GEC adaptation initiatives. Chapter 6 picks up on and develops some of the issues relating to municipal and provincial relationships raised by interviewees as stated in this chapter.

Chapter 6: Horizontal and vertical government relations and the likely effect of collaboration or lack thereof on GEC adaptation initiatives

6.1 Introduction

This chapter advances the analysis presented in the previous chapter, where Ugu and eThekwini's responses to GEC were explored critically. Evidently, their respective responses to GEC are very different and shaped by a complex interaction of dynamic influences. This chapter investigates the second research objective: to determine the relationship between Ugu and eThekwini municipalities and between these municipalities and higher government spheres. The likely effect of collaboration or lack thereof on GEC adaptation initiatives is also considered.

Adaptation is shaped by the actions of individuals, groups and governments and each level of action impacts on the other, often in a hierarchical fashion (Adger et al, 2005b). GEC poses significant challenges to governance arrangements at all spatial and temporal scales. Regarding the municipal scale, I am specifically interested in the role of inter-municipal collaboration for GEC adaptation and the barriers and facilitators to such collaboration. This interest is rooted in one of the key arguments of this thesis: while international and regional level collaborations are essential (despite their problematic nature) for addressing GECs, a sharper focus on local level intra- and inter-municipal relations, as well as relations between municipalities and other tiers of government and non-government networks, is equally important for the successful and sustainable implementation of adaptation measures, within the shifting global governance landscape.

While the importance of such finer scale relations and associated benefits of multi-level governance is beginning to be recognised within the GEC literature (e.g. Koch et al, 2007; Amundsen et al, 2010; Bulkeley and Newell, 2010; Gore, 2010), inadequate attention is still given to the importance and complexity of such relational dynamics, from both academic and policy perspectives. This is particularly applicable in the context of development imperatives in poor countries. As Adger (2005: 80) notes, "in examining adaptation, the dynamic nature of linkages between levels of governance is not well understood". This argument still applies at present. Furthermore, the growing literature, which identifies municipalities as important arenas for tackling global

environmental problems, often emphasises the importance of transnational municipal networks (see Bulkeley and Betsill, 2003; 2005; Robinson and Gore, 2005; Bulkeley et al, 2009; Gore, 2010). Bulkeley and Bestill (2003) question the potential for transnational networks of local authorities meaningfully to incorporate those non-leaders in their fields, or support policy learning and exchange because existing accomplices are mainly *informants* of best practice to the networks, rather than *recipients*. Thus, a missing thread which this thesis attempts to tie in is the consideration of finer scale inter-municipal collaboration and linkages, particularly between neighbouring municipalities, necessary for dealing with complex and cross-boundary challenges associated with GEC and how local 'leaders' and 'followers' can collaborate.

I analyse these issues via an exploration of relations among the neighbouring eThekwini and Ugu local authorities and between these local authorities and other government spheres and non-governmental networks in the context of GEC. Local authorities' responses to GEC, as well relational dynamics within and between these authorities are nested in and influenced by their vertical and horizontal relations with other government and non-government networks. This chapter reveals that, to date, progressive local level GEC measures have been instigated largely autonomously by individual government and non-government organisations. I contend that such relational dynamics have significant implications for GEC adaptation at community and household-scales. Therefore, this chapter feeds into the next chapter, where the responses and perceptions to GEC among actors within the municipal case study areas are explored.

As highlighted in preceding chapters, from a PE perspective, responses to GEC are rooted in multiple factors and shaped by the broader political and economic context. Thus the framing national and provincial politico-economic contexts need to be examined in order to understand fully the governance dynamics at finer scales and why certain policy discourses and approaches become dominant, while others are sidelined. The following section builds on Chapter 3's comprehensive review of the overarching national and provincial context for addressing GEC, through adding critical analyses of government approaches to GEC. This creates a sound basis for the examination of cross-scalar governance that follows.

6.2 Addressing GEC/CC: multiple stakeholders, multiple framings

The GEC challenge is characterised by multiple government and non-government stakeholders with varying interests and ways of conceptualising and communicating GEC/CC (Hajer, 1995; Adger et al, 2003). Chapter 2 explained how literature on framings is increasingly applied to sharpen insights into environmental decision-making and to help untangle environmental issues (Buijs et al 2011). I apply insights from Hajer's (1995) and Hajer and Versteeg's (2003) discourse analysis approach as a useful tool for understanding such framings. CC can be approached in various ways, ranging from holistic framings where broad-ranging issues are concurrently considered, to more restricted approaches where issues are addressed separately. Dominant discourses and approaches have significant policy and practical implications (Hajer, 1995; Buijs et al, 2011). Thus, it is important to understand cross-scalar interactions between different institutions in the light of framings and approaches used within the GEC debate and how these impact on each other (Agyeman et al, 2007; Koch et al, 2007). Prior to the analysis of inter-scalar relations, it is useful to consider national government's conceptualisations of GEC/CC and the implications of such framings for collaboration as well as actions and approaches adopted at finer scales (and vice versa).

Analysis of interview material, in conjunction with various policy documents, reveals that the SA national government, as well as eThekwini and Ugu local governments, have, to date, applied largely a neoliberal ecological modernization (EM) discourse (see Section 6.2) in their approach to addressing GEC and policy construction. This is particularly clear in the NCCR White Paper (2011), which promotes market-based policy measures to drive the diversification of the country's energy mix and other mitigatory actions.[64] Further, as evident in recent policies such as the NGP (2010), a major national level focus is on marketing the 'green economy'. Market-based policy measures, regulations and solutions have emerged as a global narrative and a favoured means of climate governance (Bulkeley and Newell, 2010). Also referred to as "flexibility mechanisms", market-based solutions permit countries to achieve their emissions reductions obligations through carbon trading and offsets under the Kyoto Protocol (see Chapter 3) (Bulkeley and Newell, 2010: 31). A central EM story line is

[64] As with other emerging policy, the Paper was created with input from broad-ranging stakeholders, including local government, yet core aspects reflect national level discourse and priorities.

the regulation of the environmental problem as a "positive sum game" and the national government has evidently promoted this storyline (Hajer, 1995: 65).

In the current era of neoliberalism, market-based approaches and solutions are widely favoured over command-and-control state-led regulatory approaches (Bulkeley and Newell, 2010; Bond, 2007). Such solutions do, however, require institutional backing: "Markets, in other words, have to be governed" and various tactics are employed to achieve this (Bulkeley and Newell, 2010: 32). The SA government has endorsed carbon trading from the outset of its CC response, as the NCCRS (2004: 15) explicitly declares that, "CDM primarily presents a range of commercial opportunities, both big and small. This could be a very important source of foreign direct investment."

Motivated by underlying neoliberal agendas and pressing developmental challenges, it is perhaps unsurprising that the national government has adopted this approach of emphasising CC policy as an opportunity for new revenue systems. Moreover, government bodies might perceive the framing of GEC/CC adaptation as 'new economic opportunities' (NCCR White Paper, 2011) as a strategy for public buy-in amongst those with vested interests in continued development and economic growth along existing trajectories. Local governments including eThekwini have also supported such solutions through, for example, introducing CDM projects such as Durban's notorious Bisasar Road Landfill-gas-to electricity project in Durban (Bond, 2011).

The problem with this largely business-as-usual-with-a-green-tinge-CC approach is that it can mask how little governments are actually doing to address CC and detract attention from the more significant structural changes in the economy and current development paths that are required, particularly for rooting out the causes of GEC vulnerability (Lohmann, 2008). As Hajer (1995: 32) explains, EM "does not call for any structural change but is, in this respect, basically a modernist and technocratic approach to the environment that suggests that there is a techno-institutional fix for current problems". As such an EM approach to environmental governance helps avoid structural change and addressing social contradictions.

In addition, while recognising the need to mitigate CC, SA national government officials and policy rhetoric concurrently draw on the justice-based discourse regarding

international responsibilities for GHG emissions reduction. The debate centres on the 'developed' world's historical and current disproportionately large role in fuelling CC and the linked responsibility for leading actions, versus the right of poor countries to develop and then follow the lead of developed countries (see Chapter 3). Arguably, this 'geographies of responsibility' (Bulkeley and Newell, 2010) discourse is not particularly applicable to the SA context since it is characterised by an advanced developing economy with high historic and current per capita emissions quotas comparable to many Northern contexts.

In sum, national government's approach to GEC/CC draws strategically on multiple framings and discourses (e.g. CC as a justice issue requiring differential action, an economic opportunity, a development challenge), some more broad-ranging than others, for different purposes in different contexts. In turn, businesses and various organisations often tactically frame their policies and activities through similar discourses in order to receive state support without necessarily making any significant changes in behaviour or actions, such as adopting a 'green' product purchase policy without actually reducing consumption or adapting business practices.

Carbon trading and offsets have been open to much scrutiny and while such market-based solutions have many supporters, critics are rapidly increasing. In the local eThekwini context, many NGOs and civil society organisations are strongly opposed to CDMs and other market-based solutions. Such non-governmental institutions have criticised governments for promoting the 'privatisation of the air' and 'carbon colonialism' to address GHGs (CCS, 2011). Bond et al (2008: 5) explain that a "commodity is being created: the *property right* to dirty the air and to heat the atmosphere" and "ironically, it is those who bear the historic legacy of emissions" that benefit the most from such 'rights'. Arguments focused on injustices and inequities inherent in carbon trading have led to the emblematic labelling 'carbon colonialism' (Bond, 2011). Bulkeley and Newell (2010: 48) explain that "it is unlikely, and improbable, however, that people will meekly accept their fate as victims of forms of climate governance they consider unjust". Indeed, prominent local NGOs such as the South Durban Community Environmental Alliance (SDCEA) and civil society organisations, such as the CCS based at UKZN propose alternative framings of CC from a rights-based perspective, highlighting the injustices of carbon trading, the need

for transformation of existing economic and political systems, a greater focus on differential vulnerabilities and the need for urgent adaptation (G1, G2). There is mounting pressure from such organisations, but, according to Bond (2009: 16), climate injustices remain and resistance from many quarters have thus far been ineffectual (see also Chapter 8).

6.2.1 Talking left, walking right – contradictions between policy rhetoric and actions

Chapter 3 outlined that the NCCR White Paper (2011) emphasises both adaptation and mitigation and the need to link key developmental issues such as poverty alleviation with the GEC/CC agenda through mainstreaming. The Paper lists intended actions for mitigation and adaptation to address expected GEC/CC effects for different sectors, yet there are few specifications as to *institutional roles and responsibilities*, *time scales*, *budgets* and *how* these will be achieved. These ambiguities may serve to hinder policy development and actions among institutions at finer scales. Chapter 3 also outlined significant contradictions between the White Paper's content and corresponding national government action.

A further illustrative example is that although the need for a large scale transition to renewable energy supply is strongly emphasised, renewable sources such as solar and wind power receive little funding in comparison to coal power and still contribute less than 4% to the SA energy grid (Bond, 2011). Moreover, very little has been done in terms of investing in public transport and adapting key physical infrastructure that would facilitate the transition to low carbon lifestyles and adaptation at finer scales. A further illustrative example is the recently completed controversial King Shaka international airport and Dube trade port, situated 40km north of Durban (see Chapter 5).

In short, the SA government has not yet proven its commitment to implementing necessary actions highlighted in the White Paper, and despite rhetorical claims to the contrary, neoliberal business as usual persists. Tellingly, 40% of respondents across my case study areas were unaware of any national-level CC actions and policy. Only 19% of those who were aware, were satisfied with national government's actions to date. Amongst several other issues, these statistics reveal that government's awareness

raising and education about their CC policies and actions have been insufficient (see also Chapter 7).

6.2.2 Whose responsibility is it? Shifting responsibilities across scales between government and non-government actors

In addition to the above, government-level focus has been predominantly on technical, financial and institutional constraints on addressing GEC, while paying inadequate attention to pivotal social and cultural influences, specifically regarding adaptation. Institutional transformation within government institutions is required for the inclusion of social and cultural dimensions into GEC adaptation. However, recent literature, and my empirical research findings, reveal that government organisations at all scales have, to some extent, depoliticised CC responses and deployed a strategic approach that distances itself from the day-to-day responsibility of dealing with the issue or instigating transformation (Leck et al, 2011; Scott et al, 2011; ASSAf, 2011). This approach is influenced by weak EM and neoliberal approaches, which deal with contested situations through depoliticisation in favour of technicist and 'scientific' foci.

While government institutions at a strategic level raise concerns about CC, there is a recent neoliberal tendency to pass the responsibility of adaptation down to the level of local authorities and the individual (i.e. the 'individualist approach') (Brand, 2007). Since the early 2000s, there has been a proliferation of projects aimed at encouraging individuals to contribute to and participate in efforts to address CC (Paterson and Stripple, 2010). For example, in the case of Durban and Ugu, citizens are encouraged to modify their behaviour to be more carbon friendly through recycling and not littering, following 'best practice guides', 'green guidelines', creating green open space. Local governments often use media sources to promote these interventions using information deficit approaches which assume that the passive public will soak up these persuasive ideas (Scott et al, 2011).

To varying extents, all levels of SA government have promoted this approach. Such individualistion can be problematic as it can shift focus from underlying drivers of vulnerability, as well as GHG emissions and the state's joint responsibility to address these. In line with PE thinking, Paterson and Stripple (2010: 342) argue that a shift in

emphasis from state to individual level responsibility can mask "broader political questions of power and collective responsibility".

Arguably, there is an emerging trend in the context of CC where the state creates a particular subjectivity of the individual as a responsible citizen who will 'do their bit' (Paterson and Stripple, 2010; Scott et al, 2011). The challenge for local governments and individuals is that they begin to feel responsible for adaptation and they attempt to shift their behaviour within their sphere of influence. However, individuals and local councils can often feel powerless to change the overarching system within which they exist. They may begin to feel disillusioned as they attempt to save energy and use resources more efficiently, but have no control over the plans for the spatial growth of their city, state investment in public transport and adaptation of critical infrastructure, or the continued use of coal-fired power stations. I support the argument that adjustments in resource use and livelihoods and lifestyles will be required by every individual to adapt to climate variability and change (Adger, 2001). This notwithstanding, the individualisation of the problem without transformation of larger systems can lead to frustration and a sense of disempowerment and indeed broad scale maladaptation.

National level GEC legislation, policies and strategies of action described above and in Chapter 3 create the framing conditions within which GEC is addressed at lower government spheres and at finer community and household-scales. Evidently, contradictions, mixed priorities, a focus on individualisation of the problem without sufficient structural transformation and conflicting interpretations are central characteristics of government's response to GEC. These aspects may combine to create barriers to collaboration with other governmental and non-governmental stakeholders. The discussion now turns to an assessment of the centrality and complexities of cross-scalar interaction in greater detail, through presenting empirical findings.

6.3 The complexities of multi-scalar governance and gaps in understandings in the South African context

While various policies and strategies of action have been devised, GEC/CC, particularly adaptation to GEC, is still an emerging field within the SA context where implementation deficits pervade and roles, responsibilities and strategies are still being

negotiated. Koch et al (2007) identify a gap in the SA context regarding evaluation and understanding of how multiple institutions operate and network with regard to addressing CC. Their study attempts to address this gap through predominantly national level analyses, whereas my empirical research addresses the gap through a multi-scalar approach focused on local, and to a lesser degree, provincial government analyses. I also consider briefly the roles of non-government institutions such as consultancies. In order to gain a holistic and inclusive understanding, representatives from government and non-government institutions such as NGOs and environmental consultancy firms were interviewed for this part of the research. A list of these stakeholders, their affiliations and respective roles is provided in Appendix III.

Effective governance in the context of GEC requires genuine collaboration and co-operation between multiple scales, especially with regard to shared infrastructure and ecosystem services. This said, as the empirical results show, the complex political realities, combined with power, resource and responsibility disputes within and between institutions pose formidable challenges to such collaborative governance. While these results have emerged in the SA context where the post-apartheid transition imparts certain distinctive elements, many of the underlying issues and complexities are applicable to diverse contexts, particularly dilemmas facing poorer countries. In this chapter, intra- and inter-scalar institutional dynamics are analysed from the perspective of a multi-scale/level governance framework outlined in Chapter 2.

Koch et al's (2007) study of five national-level SA institutions[65] concludes that "institutional understanding of adaptation remains inadequate and most organisations do not fully understand what their role needs to be in terms of adapting to climate change". Empirical research for this thesis strongly supports their argument through drawing similar conclusions from provincial and local level analyses. Tellingly, Koch et al's (2007) research also reveals that, nationally, the South African National Biodiversity Institute (SANBI) is the only non-state institution playing an active role in adaptation

[65] Institutions involved in the research were the DEA, Department of Minerals and Energy representing government, the SA National Biodiversity Institute (SANBI) and SA National Parks (SANPARKS) representing parastatals and the National Business Initiative (NBI) representing non- state actors (Koch et al, 2007).

and it is mainly restricted to biodiversity concerns.[66] The authors conclude that inadequate involvement among core non-state institutions reveals a considerable weakness in SA's ability to adapt to GEC impacts (Koch et al, 2007). Indeed, non-state actors are crucial to the governance of CC (Bulkeley and Newell, 2010). Building on this conclusion, I emphasise the limitations created by inadequate horizontal and vertical collaboration over GEC.

Policy development in SA predominantly follows a hierarchical form of governance, despite the fact that inter-governmental co-operation is underscored in emerging CC policy (Koch et al, 2007; Leck and Simon, 2011). The persistence of hierarchical ordering in SA resonates with the current global order where international and national political directives continue to dominate CC debates (Bulkeley and Betsill, 2003; Bulkeley and Newell, 2010). As noted in Chapter 3, eThekwini municipality is represented at NCCC meetings. However, participation is predominantly one-sided as, according to a distinguished eThekwini representative (A1), their presence is "really about national (government) delivering messages about the state of negotiations, while we sit quietly and listen". Thus, it does not appear that local governments have been given adequate opportunity to play a proactive and meaningful role in framing the country's overarching CC response and associated policies from the outset. This is despite the fact that responsibilities for adaptation implementation are often shifted to finer scales. The distinct disjuncture between national and local level involvement in GEC policy formulation and implementation could have serious implications since, without inter-scalar input, policies designed at regional and national scales could well have unforeseen, often negative effects at local scales (Urwin and Jordan, 2008).[67]

Local government is evidently a key actor in driving GEC/CC adaptation, because, amongst other roles, it has to provide the framework and policies for encouraging the public as well as external bodies such as NGOs and private companies to support and contribute to the initiatives (Satterthwaite et al, 2009). Furthermore, this chapter emphasises an added responsibility − in conjunction with other government spheres − for fostering inter-municipal collaboration. However, several prerequisites need to be

[66] The situation may have shifted slightly since Koch et al's (2007) paper was published. However, my desktop analysis reveals that the situation remains largely the same.

[67] As highlighted in Chapter 3, emerging CC policies will be largely ineffective if supporting institutional mechanisms (including enforcement) and resources are not introduced. Several government officials noted this as a pressing concern as Box 2 in Chapter 3 shows.

met in order for local government to meet such requirements. Such fundamentals are now addressed before analysing specific issues surrounding horizontal collaboration between Ugu and eThekwini municipalities in the section that follows.

6.4 Challenges to multi-scalar collaboration and co-operation for effective governance of climate change adaptation

In order for municipalities to forge meaningful and sustained relationships, support structures are required from provincial and national government levels. Indeed, "the local politics of climate change is not taking place only within a discrete sphere of local governance, but through vertical relations of power and governance between the sub national and national state, and through transnational networks of local government" (Bulkeley and Betsill, 2003: 185). Importantly, difficulties in collaborating 'across boundaries' relate to all governmental tiers. As such, horizontal relational dynamics at the local level need to be considered in conjunction with vertical relations with higher governmental tiers. The complexities of vertical relations are now considered.

On the surface, SA has a sophisticated and well-established network of institutional and legal frameworks for potentially facilitating collaborative responses to climate variability and change. In acknowledgement of the need for vertical communication for "enhanced government coordination and policy alignment", the NCCR White Paper (2011: 37) suggests that the Ministerial political forum (MINMEC) and Outcome 10 Delivery Forum (MINTECH), established through the IGR Act (2005) (see Chapter 3) will, facilitate a high level of policy and strategy coherence between the three spheres of government and will be used to guide climate change work across the three spheres". As will become evident, such coherence has not hitherto been adequately facilitated or achieved.

Further, national government established the Ministry of Co-operative Governance and Traditional Affairs (CoGTA) in 2009. CoGTA's overarching mission is "to facilitate cooperative governance and support all spheres of government, promote traditional affairs and support associated institutions" and a key function entails the monitoring of the DMA (CoGTA, 2009: 15). CoGTA's Strategic Plan (2009:14) also recognises the "need to address the misaligned planning that exists between national, provincial and local government" as a "main challenge for co-operative governance". Added to this,

South African Local Government Association (SALGA) is a national organisation empowered by the Constitution to assist in local municipal transformation and consolidate local government (SALGA, 2010).[68] Under SALGA there are nine provincial local government associations (PLGAs) mandated to represent their respective local governments. KwaNaloga is the relevant provincial association for this study.

To date, it appears that these institutions have not reached their potential in facilitating collaboration, particularly with regard to addressing CC. While these institutions are relatively well established, they are evidently still defining their key roles and responsibilities for addressing GEC. Most interviewees did not mention CoGTA and the few that did questioned its effectiveness:

> Well, CoGTA was supposedly established to address poor collaboration. That hasn't happened. In fact, I think government co-operation has actually declined in recent years…there are all these structures in place but none actually help at the end of the day (A10).

Furthermore, SALGA's performance appears to have been somewhat ineffectual, particularly with regard to guidance on CC issues. Pieterse et al (2008: 19) assert that, "Institutions such as SALGA struggle to define their relevance and impact". Reiterating this point, key officials from both eThekwini and Ugu District municipalities cited ambiguity over the institution's role, insufficient meaningful interaction and guidance on CC issues as well as ineffectiveness when describing SALGA (e.g. B4, C5, C6, E5, F6). Recently, however, a certain prominent individual (originally employed by the DEA) who joined the new SALGA climate change branch, has provided a "glimmer of hope that SALGA may do something going forward" in relation to CC and become more effective in providing guidance and improved communication, evidenced in new SALGA CC documents distributed to municipalities for comment (A12). However, as the literature on the role of 'CC champions'/leaders shows (e.g. Bulkeley and Betsill, 2003; Qi et al, 2008; Moser and Dilling, 2007), individual or departmental champions require wider institutional backing for sustained impact.

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[68] Curiously, the NCCR White Paper (2011) omits the central role assigned to SALGA under the Green Paper (2010: 32), "to actively participate in the inter-governmental system and ensure the integration of climate adaptation and mitigation actions into Integrated Development Plans as well as massively up-scaled public education, awareness, media and information on climate change".

Recently, SALGA has utilised prominent events such as the 2008 National Summit on Climate Change in Johannesburg and the Local Government Climate and Environment Indaba hosted by SALGA in July 2009 as platforms to encourage municipalities to share information on CC initiatives and work together to solve problems (F2, B2). Added to this, KwaNaloga, chaired by eThekwini's Mayor, hosted a Climate Change and Rural Development Summit in Durban from 8-10 March 2010, where all municipalities from across the province were invited to attend. The main purpose was to share experiences and determine collaborative ways forward for addressing CC and rural development (see also Chapter 5). Nevertheless, despite the fact that these organisations and all government spheres rhetorically support the need for inter-governmental co-operation for addressing GEC/CC, there is a lack of national and provincial support mechanisms (including financial and human resource investment) forthcoming to foster substantive and ongoing co-operative initiatives, specifically at the local government level. To quote Schmidt (2008: 109) on how SA government policy functions, "We are strong on ideas and conceptions, poor on implementation".

A case in point is that, despite the intended outcome to "enable participating stakeholders and government departments to act synergistically on climate change issues" (KwaNaloga, 2010: 3), to date no functioning 'partnerships' or new information-sharing collaborative forums have been created as a result of the KwaNaloga conference (A4, A11, B6). Various reasons for this can be surmised, but an Ugu representative (B6) pointed out that, from her department's viewpoint, the major issue is that there are no key 'points of contact' driving the CC agenda and continuously encouraging municipalities to form partnerships. Similarly, an eThekwini representative noted cynically, "that was more of a political show than anything else really; no parties really showed interest in pursuing long-term partnerships" (A3).

Through observation and private conversations at the Summit I discovered that as the municipal CC leader, Durban was the 'go to' municipality and its representatives appeared to be continuously called upon to help drive the Summit process. Further, the Summit outcome: 'Strategic Plan for Climate Change and Rural Development' (2010), which documents key recommendations was compiled, supposedly in light of discussions and roundtables at the conference. This document could serve as a potential catalyst for sustained collaborative GEC actions between municipalities as it outlines

common short, medium and long-term goals. To the contrary, key stakeholders felt that uptake had been slow, even non-existent, since the Summit and commented that there was no forum or advisory board driving the agenda. Moreover, probably due to their considerable expertise, eThekwini representatives were called upon (in private) at the end of the Summit to provide key input for the recommendations noted above (pers. comm. 10/03/10). Together with their 'go to' status, this action seems to contradict the supposedly collaborative nature of the Summit and highlights the often tokenistic nature of inclusiveness in supposedly participatory processes.

Contrary to dominant local government views, a provincial department representative noted that KwaNaloga and SALGA *do* play a facilitatory role, expressing that his department works closely with both organisations. Yet, he had similar views on vertical collaboration: "KwaNaloga needs to employ competent people to do this, but you know it borders on lack of knowledge and it is a priority issue with many other pressures higher in concern rankings" (F2). Despite repeated and persistent efforts to set up interviews with representatives from KwaNaloga and SALGA via telephone calls and e-mail, none of these came to fruition as contacts were reluctant to commit to appointment dates and others simply did not reply. While the results do not reflect direct viewpoints of such organisations, the fact that the majority of respondents from unrelated and related organisations as well as official government documents raised similar points regarding these institutions the results are interpreted as being unbiased.

Co-incidentally, KwaNaloga and SALGA's poor communicative capacity was cited various times by interviewees as a main inhibiting factor to vertical and horizontal communication. Underscoring an inhibiting rather than facilitatory role, A10 explained:

> They (KwaNaloga) seem to be the problem actually, the ones preventing things from going forward and helping us to make those connections with other municipalities near us. KwaNaloga are just difficult to pin down. I mean, it is easier to get hold of municipalities in Kenya; how can that make sense?

In SA and many other contexts, local governments have been at the forefront of CC responses. Swilling (2008: 79) argues that "It is unsurprising that local governments lead the way in responding to the sustainability crisis – it is at the point of everyday living that this crisis will be experienced in the first instance". Thus, local-level initiatives and experience can potentially provide valuable input into national-level strategies and policies. Despite the existence of facilitatory institutions such as SALGA,

the empirical results reveal that vertical and horizontal interaction, information sharing and collaboration remain weak. This is particularly the case with environment-related issues. When asked to describe the interaction between national and provincial levels and eThekwini environmental department a key informant explained that, "It's almost non-existent; I mean there isn't any, it's as simple as that…well … there isn't anything meaningful. Ja, SALGA is ineffective, SACN is ineffective; national never speaks to us and province, really, why were they even created?" (A11).

A prominent Ugu environmental department representative (B6) explained that specific guidance and support are lacking from higher tiers of government since, "that is what is needed for these climate change things to succeed; it must be very specific to run across everything and channel us and put us on the right track, very important for this is the issue of communication and partnering". An employee from the eThekwini planning department noted the need for improved support and collaboration as follows,

> The only time that province or national government seems to get involved is if they are funding a project, then they are on your back like crazy; not a facilitative role like we would need. It's management which we don't need more of….and they certainly don't ask for our input. It is a one way information flow; you submit to them and they are not offering any guidance or support" (A6).

The majority of local government officials (83%) interviewed agree that this lack of meaningful interaction on CC issues from both national and provincial government is a problem that urgently needs to be overcome. Poor provincial support mechanisms, weak collaboration and fragmented responsibility are certainly not unique to the SA or 'developing' contexts. As Robinson and Gore (2005: 116) highlight in their Canadian study, despite their direct link to municipalities, "provinces cannot be counted on for widespread political leadership on the climate change issue". They explain that complex power relations and fragmented responsibilities between government spheres are major obstacles to collaboration in the context of CC. Further, the authors highlight that provincial economic interests in retaining automobile and fossil-fuel based economies hamper effective leadership at this level (Robinson and Gore, 2005). These arguments resonate closely with my empirical findings.

In sum, for the most part, local government interviewees in authoritative positions expressed their frustrations regarding ineffective support and interaction from provincial

and national levels, not being consulted about national-level CC decisions, as well as inadequate guidelines and policies informing climate related actions, particularly adaptation. Additionally, many local level authorities in both case study areas felt that there is a distinct lack of understanding at the provincial and national government scales about local level realities and contextual considerations. This can also be attributed to inadequate upward − as opposed to only downward − information flow from local to higher government spheres. One eThekwini official (A2) noted that there *is* upward information flow and implied 'bottom up' guidance, but this was usually instigated by higher government spheres, as a way of tagging onto progressive CC ventures, than necessarily for local level benefit:

> We are guiding *them*, unfortunately; that is the way it is. They are not in the same boat as us in addressing climate change. But, then again, whenever we do an exciting or progressive project here they quickly register as stakeholders so they can jump on the wagon and be seen in that light!

6.5 The perceived centrality of politicians in addressing GEC/CC

The role of politics and politicians in shaping CC responses and collaboration at all scales emerged as a key theme. Despite the fact that the government launched its NCCR strategy more than 7 years ago, CC has not received necessary political prominence, as evidenced in the fact that CC barely featured in the 2011 Budget Speech or the State of the Nation Address. While most respondents, from grassroots to government levels, emphasised the importance of politicians for potentially driving CC agendas and facilitating inter-governmental collaboration, most expressed concurrent concern and a distinct lack of confidence in politicians and their involvement thus far in addressing GEC/CC. As one non-governmental interviewee from the Ugu region noted,

> I think that the primary issue in this country, no matter what Mr Jacob Zuma said at the climate change… um… lets call it disaster that happened now in Copenhagen, no matter what he said, it is all lip service, because the politicians haven't bought into this environmental care idea. Politicians have never and still are not accepting the huge role that the environment plays in the wellbeing of their people. So how can you expect co-operation between government if politicians are not driving it (C5).

Similarly, respondent B7 noted, "well, the fact of the matter is that it is not a priority issue for politicians. They are the leaders, the ones that the public focus on and listen to and this is a problem for us, you see; other priorities get the vote count first". These points noted, politicians are also led by public directives and act according to perceived public priorities and demands. As Kofi Annan contends, "people are beginning to

understand. And when they understand, politicians will have the courage to act" (Mellgren, 2007). Thus, addressing GEC/CC must be understood in the context of bi-directional state and non-state actor relations. The need for GEC education and awareness raising for politicians was underscored by several interviewees and as A7 explained,

> Often, they (politicians) are politically strategically placed in a position, for whatever reason, and are given the responsibility to try and address issues they don't know much about, like climate change; that needs to be addressed before we can move forward.

Certain local government and non-government officials, from both municipalities, also predicted that high-level politicians representing KwaNaloga, SALGA and national government who had hitherto disregarded the CC agenda were going to use the hosting of COP 17 in November-December 2011 as a marketing strategy rather than an opportunity to meaningfully drive the CC agenda (A6, A8, A9, C3, C4, E3). Disgruntled eThekwini municipal representatives also felt that their contributions to Durban being awarded the host city for COP 17, as well as their potential role in supporting provincial and national government in the build up to and at the event were being overlooked (A8, A9).

Despite being approached by provincial government to share their experience to "help province get out the starting blocks for CC", a disaster management representative (A9) expressed his disappointment at this subsequently being disregarded:

> As a province, they focused entirely on COP 17 in terms of how *they* are arranging it and *driving* it, so trying to take the focus away from the city of Durban. Their focus is on how brownie points can be earned at the national and international level. It's showcasing and I'm sure once it is over things will go back to normal and they will look for another opportunity.

Another official noted,

> We did a lot of the groundwork for COP here in eThekwini but that is being sidelined by higher spheres. Key climate issues are going to get lost in the dust cloud of mayhem and competition for marketing certain aspects. We are recognised sometimes, when it suits, but for COP 17 we must rather go sit on the beachfront and have a cup of coffee, that is when politics comes in (A8).

These concerns resonate with the above discussion where critical dynamics of upward information flow and collaboration were considered.

As alluded to, several local government and non-government officials, from both municipalities, also expressed a lack of confidence in politicians' expertise and abilities for addressing GEC. As a prominent environmental consultant commented after attending a Pre-COP 17 conference, "I cringed listening to what these politicians were presenting today. I hope government doesn't embarrass us like this at the actual conference" (C4). These negative perceptions and tense relations pose a formidable barrier to inter-governmental co-operation and for the various levels to progress in driving the CC agenda.

6.6 Conflicting interpretations and attitudes: the example of disaster management

While undertaking empirical work it quickly became clear that a major barrier to horizontal and vertical communication relates to conflicting interpretations and attitudes towards CC and associated impacts. To illustrate this point, I draw on the issue of disaster management, as it was a dominant issue raised by interviewees and in locally relevant literature. Here, I do not imply that disasters are synonymous with CC, but one crucial aspect of CC and that proactive disaster management is pivotal to broader long-term adaptation strategies. A prominent eThekwini official agreed that the DMA and related legislation helped to focus responsibility towards prevention and encouraged a more proactive approach to disaster management. Nevertheless, "shifting from response to risk reduction has happened by way of legislation but in practice it hasn't happened, that is a big threat to CC adaptation" (A5). In agreement, a colleague stated, "we still have to bring the authorities from where they are and change their mind set from response to risk reduction, but this is a huge challenge" (A8). Building on this, A9 explained, "disaster management means different things to different people. The powers that be still view disaster management's role primarily as welfare, it is an institutionalised mind set. It is also a political tool to provide people with blankets and baked beans after a disaster".

Echoing similar sentiments, an Ugu representative noted that,

> The understanding of a disaster, even within our municipality, is different. People often can't distinguish between an incident and disaster and use up disaster budgets for incidents by handing out so many blankets and things, that is always their response. But what about the long-term and real disasters? (B5).

Several stakeholders noted that as consequence of conflicting interpretations at various government levels disaster management units do not get adequate funding, and the key

role of disaster management for CC protection and preparation is often overlooked (A8, B7, B5, B1, C5).

At the municipal scale, certain departments are trying to shift this understanding of disaster management and highlight its pivotal cross-cutting role but this has not yet been adequately recognised and institutionalised (Roberts, 2010). This can be attributed to the critical factors discussed above such as the persistence of historically institutionalised reactive disaster management. eThekwini's experience in developing their MAP revealed that, "without a strategically placed and fully functional disaster management system, local level resilience will ultimately be a pipe dream" (Roberts, 2010: 401). In other words, a pro-active and strategic disaster management function is a lynchpin of long-term adaptation. This needs to be supported by higher government tiers yet conflicting attitudes and perceptions towards disaster management within and between governance scales create a formidable barrier. Further, Carmin et al (2011: 6) and Roberts (2010) explain that sector policies are required to promote adaptation at the municipal-level, yet the mandate to prepare DRR plans under the DMA (2002) had "no bearing on adaptation in Durban". This argument also applies to Ugu/ULM.

Interviewee A3 from eThekwini went so far as to say, "disaster management is basically non-existent in the city". A major constraint is that, presently, allocated local disaster risk management responsibilities are largely reactive, whereas CC adaptation requires proactive planning and action (ASSAf, 2011). This mismatch has undermined disaster management function's to guide IDPs strategically in both eThekwini and Ugu, and this is a major constraint to municipal and local level adaptive capacities (Roberts, 2010; ASSAf, 2011; Carmin et al, 2011, and B6, B7, A8, A9; A3). This issue of multiple interpretations and priorities over the same issue is broadly applicable in the complex context of addressing the multiple causes and impacts of GEC.

Despite significant barriers to collaboration between governmental spheres outlined above, I argue, in line with government *rhetoric,* that there are very substantial synergies between GEC adaptation and optimally functioning relational dynamics between all tiers of government. In the early absence of national level support and institutional frameworks, municipalities such as eThekwini, Cape Town and Johannesburg created strategic partnerships with other external and internal support

mechanisms and networks (Section 5.4 highlights eThekwini specific details). For example, these municipalities are affiliated to ICLEI, Local Governments for Sustainability, an internationally networked local government coalition that co-ordinates information sharing and learning about local government responses to climate change and sustainability challenges (ICLEI, 2010). Sporadic engagement between several metropolitan municipalities has taken place through the South African Cities Network (SACN). However, the SACN has not reached its potential as a platform for municipal engagement on GEC/CC and has also been criticised for being too heavily focused on energy security at the expense of other GEC/CC priorities such as adaptation (Mokwena, 2009; A12).

It is within the above described complex governance arrangements and socio-political context that local municipalities are forging their responses to GEC. This overarching context shapes the action and policy space within which finer scale municipalities and individuals manoeuvre and respond to GEC challenges. The complex relational dynamics between Ugu and eThekwini municipalities are now considered in more detail.

6.7 Municipal-level institutional capacity for streamlined initiatives

In 2009, eThekwini municipality established the Municipal Institute of Learning (MILE) as a five-year pilot programme the functions of which include the co-ordination of knowledge management within eThekwini and surrounding municipalities to assist co-ordination and avoid duplication of efforts. Importantly, one of the key rationales for MILE's establishment is "the urgent need to co-ordinate and help streamline the various relationships that eThekwini has developed with other municipalities, agencies and networks" (MILE, 2010). However, most municipal representatives did not mention the institute at all, and those who did raised concerns over its performance to date. This is not only due to MILE being under-capacitated and inadequately supported by KwaNaloga (A6, A7), but their efforts are also hampered by the issue that "some departments are quite protective over their information as they feel they have done the groundwork so why should they spoon-feed others and some departments are more willing to collaborate than others" (A5). From MILE's perspective, A7 explained the importance of inter-municipal collaboration and some of the challenges faced by MILE:

> Borders don't follow catchment areas and so on but the thing is there are no real joint projects I know of with other bordering municipalities, even with the existence of MILE. Departments have been briefed but don't approach us. Also, in a meeting about the eco schools project, one of the leaders insisted on only looking at Durban schools, because that is where contacts exist. Really though, schools and municipalities in different parts of KZN can and should learn from each other, but then again funding is also key.[69]

As revealed further in the analysis below, similarly to facilitative organisations such as SALGA, MILE has not yet adequately fulfilled its intended purpose and potential to foster co-ordinated GEC/CC initiatives between eThekwini and neighbouring municipalities. However, this situation will potentially shift as time progresses because MILE has only been an active organisation since 2009 and still has many administrative, organisational and capacity matters to address.[70]

6.8 Inter-municipal collaboration in the context of GEC: the case of eThekwini and Ugu municipalities

Metropolitan municipalities with strong urban cores have emerged as CC leaders in SA while rural-orientated municipalities lag behind significantly. Through drawing on empirical and documentary analyses, Chapter 5 revealed likely reasons for this to include, amongst other aspects, the larger and more diverse resources often available to strong urban cores; stronger human resource capacities with key individuals often acting as catalysts for climate action; successful networking with local and international bodies, thereby strengthening knowledge and sometimes financial resource bases; as well as key staff dedicated to GEC/CC issues. However, in order for these strong urban cores to strengthen adaptive capacity and maintain long-term adaption to GEC impacts (e.g. food security threats), it is important that they create resilient bi-directional, supportive and sustainable linkages with their rural hinterlands. Conversely, rural and often under-capacitated municipalities have, to date, been less engaged in CC initiatives and networks. Hence, such municipalities are less likely to be in influential positions in national negotiations and would potentially benefit from partnering with metropolitan municipalities who could represent their shared interests (Mokwena, 2009).

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[69] This is a telling example where joint learning opportunities are being overlooked since Ugu and other KZN municipalities are also rolling out eco-schools projects.

[70] Due to limited capacity and resources, MILE is taking an incremental approach to implementation, subject to review and reformatting after a five-year trial period (MILE, 2010).

Although collaboration between bordering municipalities, at face value, appears to be an obvious and necessary link, my empirical results reveal that this is not necessarily reflected in reality and is underpinned by multifarious complexities. The previous chapter explored Ugu and eThekwini's responses to GEC. These two municipalities provide an important example of contiguous municipalities (in physical and social terms), yet characterised by diverse core features and functions such as developmental priorities, economic activities and profiles and key infrastructure. These divergences are largely due to their differing rural and urban orientations and specific histories.

Such diversity appears to act as a barrier to the formation of inter-municipal partnerships and collaboration. Representatives from both municipalities openly admit lack of engagement and commonly noted that much lip service is paid to governance ideals while, in reality, most government levels battle to fulfil them. Representatives from Ugu/ULM and eThekwini argue that, although there are potential benefits to collaboration over several aspects, the municipalities' differing foci largely negate the necessity for constant collaboration and joint ventures, particularly with regard to tackling GEC. As an eThekwini official explained,

> But you must remember, we don't talk to them, hey, and that's the point: it's that we have *nothing* in common with Ugu, Sisonke or any of those. The people we talk to will be Cape Town, Jo'burg, because we are a local government that is more reliant on big metros. Obviously, we would never talk to the District (A11).

In a joint interview two officials shared similar views,

> I mean if we had to sit down around the table with Ugu what would we talk about? It would be a very short conversation (A11). Ja, it would be a very one-way conversation too! (A4). A11: ya, I agree, but I guess we have had one or two odd bods, like once every five years someone will come here and sit and chat then we never hear from them again so it is certainly not a consistent thing.

Similarly a key Ugu municipal official expressed her views on collaboration as follows**:**

> …the *coastal cities*, Durban, PE, East London, CT: let them get together, but the coastal *district municipalities* can also have another network that can operate at their level because probably issues are going to get confused; we have got no big issues to talk about with them (B6).

Evidently, diversities in departmental and individual expertise also fundamentally influence municipal collaboration over GEC. Several respondents (B7, A1, A2) noted these differences in institutional expertise and CC representatives as significant constraints to collaborative ventures.

The above arguments relating to barriers created by municipal diversity are broadly applicable. Similarly, Gore's (2010) research on Canadian municipal networks and Bulkeley and Betsill's (2003) comparative research in UK and Australian municipalities revealed that – even in the very different contexts of high-income countries – municipal diversity in terms of population size, socio-economic character and so forth poses a barrier to cohesion over joint municipal advocacy positions.

These aspects noted, several municipal and other key official interviewees did recognise, more strongly, the need for and benefits of inter-municipal collaboration: "on this side of the world, in Ugu, we are victims of our own development, but we are also victims of our neighbour's development, because it knows no boundaries" (B1), "there is very little collaboration between Ugu and eThekwini, but I'd like to see more, especially in terms of natural assets" (E5) and" more inter municipal communication is definitely desirable but difficult to achieve" (A7).

The importance of collaboration notwithstanding, authorities from both municipalities, as well as external authoritative figures interviewed for this study, emphasised the following additional key barriers to inter-municipal collaboration which are often cited more broadly in governance-related research: interdepartmental conflicts, conflicting priorities, departmental protection, complex governance structures, lack of support from politicians, high staff turnovers in government departments which disrupt existing communication channels and often slow progress, institutional constraints, unequal skills and technical capacity between municipalities and ineffective communication channels.

Importantly, while this thesis is based on empirical findings from Ugu and eThekwini municipalities, it appears that inadequate inter-municipal collaboration is a provincial and SA-wide phenomenon (Mokwena, 2009; ASSAf, 2011). This point is reiterated by an eThekwini Planning Department representative's (B6) explanation in Box 6 below.

This interview excerpt between B6 and myself also encapsulates key points raised by other interviewees (e.g. A5, A7, A10, A12, B1, B7) about communication problems and suggestions for allocated staff or forums for facilitating inter-municipal collaboration (over and above MILE).

Box 6: Excerpt from interview A6

A6: I think communication is something we need dedicated staff to assist us to develop, as it is a definite problem. And when it comes to speaking to surrounding municipalities, we have a big problem, mainly because there is a lack of dedicated communication structures. In fact, it is even worse, much worse, than our inter-departmental problems, and information sharing. Getting copies of IDPs and SDFs, you can, but is near impossible. I have, for example, the Kwadukuza municipality Spatial Development Framework (SDF) and I am very happy to have it, but it is a bit like pulling teeth.

HL: Is it the same with Ugu and Umdoni?

A6: Ja, Ugu absolutely and with Umdoni, it's kind of like if you call them to a meeting they will come and then there will be a whole of talk about sharing plans but then it never happens. We don't have proper forums that are set up to actually engage on a regular basis.

HL: So there is a definite lack of collaboration between bordering municipalities

A6: Big time, we really need to work on it going forward.

While communication and the other noted barriers are important and need to be addressed, I discovered through further probing and cross-questioning that there are also deeper historically rooted and socio-politically infused reasons for the apparent lack of co-operation between municipal bodies that require attention. These fundamental issues are now examined.

6.8.1 Views from the outside: non-governmental representatives perceptions on inter-municipal relations

Several non-governmental representatives with close relations with the two municipalities revealed telling insights into inter-municipal relations. It is worth quoting two examples at length to illustrate significant issues. A prominent Ugu-based environmental consultant explained:

> What is frightening is that there appears to be a reluctance from the larger municipalities such as Durban to come and work and share in the smaller municipalities. I hear them when they say that their workload is huge, but sometimes that is also a useful excuse. On the contrary to that, there is also the issue that the smaller municipalities are just too bloody arrogant to ask the larger municipalities to help out in the smaller municipalities. In my NGO and professional experience, I see the case of 'oh big eThekwini is doing this and then it will roll out, they will lead the way'. I'm not sure I have ever seen this rolling out happening (C5).

It appears that there are varying underlying reasons for both municipalities' reluctance to engage. As a high level DEAE representative interestingly explained,

> I have picked up in meetings before, Umdoni doesn't like the way eThekwini does stuff, but I think that is probably more politically based than anything else. You see, eThekwini is known by Umdoni, Ugu and actually by us to be pretty much with the attitude, if they want to do something they will do it and ask later. Umdoni is not willing to put themselves in a boat to be seen as 'oh they are collaborating with eThekwini they obviously are *like* eThekwini'. So I think that forces them to keep some distance away from eThekwini because they don't want to be seen in that bad light (F1).

These two quotes point to significant underlying political tensions between the two municipalities that pose barriers to co-operation over GEC and other issues. These tensions stem from, amongst others, the disparate nature of resource allocations, tax bases and staff capacities between rural and urban municipalities that originated in the apartheid era and are yet to be effectively overcome. Despite eThekwini's superior environmental reputation, F1 underscored that, "interestingly with eThekwini municipality, they are one of our biggest transgressors, so although they have a strong environmental component it doesn't mean that they comply with environmental requirements". Here, the interviewee was referring to transgressions such as non-compliance with EIA conditions and inadequate reporting to provincial level on various developments. Therefore, sometimes Ugu and Umdoni deliberately avoid engaging with eThekwini as a political strategy and to maintain support from key organisations such as DEAEA. Evidently, attitudes, perceptions, political motivations and image concerns significantly influence inter-municipal collaboration. Few government officials openly addressed these issues, probably due to their sensitive nature.

6.9 Antagonistic interplays: inter-municipal tensions and competitiveness

Nevertheless, reiterating the above comments, some officials were openly cynical, as one official touted with reference to Ugu municipality:

> Oh please, do they even know climate change exists? Plus, they have incoherent structures, we never know who to contact. I am not even sure they have a functioning environmental department; I foresee that we will have great difficulties in working in that area. (A4)

Conversely, certain Ugu representatives were clearly defensive about their CC agenda in comparison to eThekwini's, as evident in the statement, "you know, they (eThekwini) are looking at simple things that anyone can look at how to mitigate and adapt to climate change…. I am not sure what the hype over them is about really, although ours is not compiled in some fancy booklet, but it's basically something that you can see in the pipeline" (B1). These quotes reveal deep-rooted tensions (as described above) relating to power dynamics (e.g. between rural and urban orientated municipalities) as well as underlying competiveness (e.g. for the purpose of marketing and budgeting strategies, political support) that characterizes municipal relationships. These tensions create a significant barrier to co-operation.

Evidently histories of inequity, scepticism, mistrust and injustices are played out in the contemporary politics of climate change (Bulkeley and Newell, 2010). Notably, however, I am not advocating that inter-municipal relations should necessarily be harmonious. Rather, a degree of competition can be beneficial for encouraging municipalities to meet their goals (including CC initiatives) and perform for funding, provincial or national recognition, support, and other benefits that can enhance adaptive capacities. However, this caveat does not detract from the broader arguments in favour of enhanced multi-level collaboration and communication to support adaptation across scales. Underlining the adverse consequences of inadequate co-operation, a key official (C3) warned, "Developers take advantage of the weak collaboration, they play us against each other, they know neither party are willing to take responsibility and each does not know what the other is doing".

Despite the very real barriers described, municipalities – especially small, less well endowed and capacitated ones – do stand to benefit from increased communication relating to GEC/CC and other initiatives. While perhaps not sharing specific similarities, even between directly bordering municipalities, as municipal officials have

pointed out, there are certain broader aspects over which municipalities can collaborate. Moreover, the Academy of Social Science of South Africa ASSAf 'Low Carbon City' comprehensive study (released in August 2011), which focuses on Durban as a case study, strongly promotes multi-level governance (horizontal and vertical). Very significantly for my study, the report underscores that there is "much potential" for horizontal collaboration between "adjacent (and sometimes more distant) municipalities sharing their knowledge and experiences" around CC (2011: 142). In sum, and in line with arguments presented in this thesis, a key suggestion proposed in the report (2011: 128) is for Durban's urban boundary to be extended and enhance adaptations through "taking a broader view of the urban system and not constraining interventions to administrative boundaries".

Reiterating these findings in one of the very few SA studies to consider comparatively municipal responses to GEC/CC, Mokwena (2009: 29) concludes there is "scope for far greater information-sharing" and a "need for better coordinated strategic interaction among the municipalities" (with reference to eThekwini, Cape Town and Johannesburg municipalities). Crucially, both ASSAf's (2011) and Mokwena's (2009) main conclusions reiterate the salience of the principal arguments I make in this thesis. There are various ways that this could be addressed. For example, Ugu could perhaps learn from the leading metropolitan municipalities such as Cape Town and eThekwini with regard to lessons learnt and strategies adopted in MAPs. While adequate contact and integration are difficult to achieve in practice, initial ties can be formed through simple actions such as smaller municipalities with young and understaffed environmental departments making their existence and functions known to larger municipalities with more established departments. More crucially, despite their differences, adjoining municipalities do share SES and core infrastructure such as transport networks, which require collaborative governance for optimal functioning under GEC pressures.

As is now well established, despite intentions of post-apartheid structural and institutional restructuring to address historical imbalances and socio-economic disparities at various scales, vast disparities and injustices remain. The comparative analysis of Ugu and eThekwini explicitly reveals the persistence of such disparities and injustices. These unequal power relations and inequities strongly influence the way in which municipalities approach GEC, particularly the politics of addressing cross-

boundary GEC issues. I argue that it is the imbalance in institutional capacities, knowledge bases, resources and links to external support networks between municipalities that provides a key motivation for information sharing and interaction. Ineffective interaction between municipalities, particularly between weak and strong bordering municipalities, which share natural and human resources is likely to undermine CC policies and initiatives, particularly in the longer term. Bulkeley and Newell (2010: 36) warn that, "there is a powerful sense in which climate change has the potential to further aggravate inequalities within and between societies". Building on this statement, I argue that inadequate horizontal and vertical collaboration in the context of CC has the potential to further engrain injustices and inequalities between communities occupying different municipal spaces and between their respective municipal government institutions.

6.10 Collaboration and networking amongst other municipalities countrywide

Significantly, several other metropolitan councils such as Cape Town and Johannesburg, as well as smaller councils such as Potchefstroom, have recently emerged as 'climate leaders' in their efforts to prioritise CC adaptation (Carmin et al, 2009). Despite concomitantly pursuing GEC/CC adaptation, there has, however, also apparently been surprisingly little information sharing and collaboration between some of these bodies. As Roberts (2009: 9) notes, "At the present time there is no structured co-ordination or communication between these different communities and, therefore, no domestic efforts to promote joint learning or sharing of best practices." Recently, however, these dynamics have shifted, with certain similar metro municipalities in different provinces such as eThekwini (KZN) and Cape Town (Western Cape) developing structured and networked communication over their relevant GEC/CC practices and experience. Moreover formal joint ventures such as a coastal cities network are also under formation (A12; Carmin et al, 2011).

Hence, despite initial shortcomings, several municipal officials agreed that these recent working partnerships between municipalities facing similar GEC challenges are likely to be highly beneficial to both municipalities and their citizens for long-term GEC/CC adaptation. Building on these new networked relations, district municipalities such as Ugu and adjoining Sisonke can potentially begin to develop similar beneficial horizontal partnerships. In turn, through partaking in best-practice and knowledge

sharing, municipal bodies can create a countrywide networked and co-ordinated web of influence and possibly have more clout in influencing and informing national and even international level relations. This suggested shift to networked municipalities is likely to encourage a more contextually appropriate inside-out approach to GEC strategies as opposed to predominantly hierarchical, top-down strategies from national government level, often based on international practices and lacking sufficient modification to the SA context. Importantly, inter-municipal actions could be prompted by 'trigger events' such as extensive cross-boundary coastal damage caused by storm surge and the impending threat of sea-level rise, which can usefully be approached through collaborative adaptation measures. Moreover, seeking cross-scalar synergies among actors and institutions is central to tackling prolific situations where adaptation measures (e.g. adapting cross-border physical infrastructure) and barriers thereto are beyond the realm of influence of single actors or institutions (Moser and Dilling, 2007; Moser, 2009).

Building on Ernstson et al's (2010) argument for 'systems of cities'[71] (conceptualised in Chapter 2), in which social and physical interactions produce flows of energy, commodities and information among networked cities, municipalities can potentially benefit from arranging themselves as components of a 'system' of municipalities where cross-scale linkages and interdependencies between ecological, social and technical arrangements that connect municipalities are reconsidered and shape GEC adaptation decision-making and actions. The systems approach to urban governance, which also draws on urban ecological insights, has been widely promoted as central to tackling cross-scale GEC challenges (e.g. Bai et al, 2010, Grimm et al, 2008; World Bank Urban and Local Government Strategy, 2009).

In many cases, networks or coalitions between individual local governments have been effective in addressing transboundary environmental and developmental problems such as infrastructural planning (Wilder et al, 2010). These can provide useful insights and lessons for informing GEC research and forming partnerships between local governments, particularly neighbouring municipalities (Bai et al, 2010; Simon, 2010). Such municipal coalitions can "improve the voice of local actors and therefore increase

[71] The notion of a 'system of cities' rather than single entities is adapted from geographical studies (Ernstson et al, 2010).

the likelihood of influencing policy and action and broader spatial or institutional scales" (Bai et al, 2010: 133). This notwithstanding, currently collaborating municipalities (e.g. Cape Town, Johannesburg and Durban Metros) share several similarities in terms of priorities in addressing GEC, funding, capacities and so forth. Such similarities are precisely why the municipalities were willing and able to forge reciprocal relationships. Due to the significant disparities between municipal bodies on a provincial and country wide-scale municipal-led initiatives will be more difficult to establish.

6.11 Power plays – the role of horizontal and vertical power relations in influencing co-operation

Understanding the role of power is important for understanding horizontal and vertical government relations in the context of GEC/CC. Houghton (2005: 419) highlights that power is affected through the performance of interactions. Evidently, the vertical and horizontal relationships between government institutions, as well as between state and non-state institutions, are infused with power plays and different viewpoints regarding the role of power in addressing the issue of GEC. Underlying distributions of power within society influence the type of GEC decisions and actions taken (Adger et al, 2003). Unequal histories have largely shaped the complex power dynamics and inequalities that exist between different municipal bodies and between other spheres of government. These power relations are played out in place, while mobilisations of power within place influence the extent and outcomes of communication for addressing GEC. Such communications (or lack thereof) influence responses to GEC within particular places. Moreover, power is expressed through discourse as dominant discourse influence policy and consequent actions adopted (Hajer, 1995).

6.12 Summary and conclusions

This chapter has provided an examination of the relationship between Ugu and eThekwini municipalities, as well as between these municipalities and other governance spheres regarding GEC/CC agendas. The likely effects of the identified inadequate collaboration between government spheres on GEC adaptation were considered at length. While recognising that the broad argument for multi-scalar GEC governance is now relatively well established, I propose that existing governance dynamics need to shift focus on strong bi-directional linkages between all governmental tiers and

encourage local networked government bodies to take the lead in climate negotiations. Such linkages can be instigated by supporting institutions such as SALGA and KwaNaloga (in the SA case) and are potential catalysts for creating working relationships between bordering municipalities, particularly important for bordering strong and weaker municipalities.

Due to its cross-cutting nature, GEC/CC cannot be addressed successfully at any single geographical scale or by any one category of actor. Often biophysical (e.g. ecosystem), social (communities) and infrastructural (e.g. sectors and industries) aspects, amongst others, do not coincide with constructed politico-administrative and other boundaries and decision maker's spheres of influence (Moser, 2009; Wilder et al, 2010). The common mismatch between ecological and physical phenomena and the reach of institutions, organisations and social processes that affect and govern them requires that the extent and challenges to cross-scalar governance, particularly in the context of GEC, be considered. As the empirical results show, there are many challenges to cross-scale interactions. Some of these are context specific and others are more broadly applicable and have been similarly highlighted in related literature. Such issues require urgent attention for GEC/CC adaptation actions, which often straddle boundaries.

Weak horizontal and vertical networking between governmental tiers, as discussed in detail in this chapter by means of drawing on various institutional examples, poses a critical barrier to adaptation at all scales. Lack of information sharing, communication and reciprocal learning between similar municipalities throughout the SA landscape represents an obstacle to the adoption and implementation of effective climate adaptation programmes and has serious implications for the integrated response to GEC, envisioned in the NCCR White Paper (2011). The institutional and governance constraints highlighted in this chapter limit capacities to respond and adapt to CC and variability at all scales.

Incoherence relating to policy co-ordination and actions between government spheres has arisen from the complexities of dealing with vast numbers of varied stakeholders ascribing to different GEC framings and discourses, as well as the diverse spaces of climate governance and action (Bulkeley and Newell, 2010). Indeed, the governance of GEC/CC is characterised by dynamic webs of connectivity between multiple role

players and institutions rather than straightforward linear interactions. Moreover, the diversity of cultural settings wherein adaptation takes place necessitates a networked approach to governance not simply local level replication of higher order policies and actions or vice versa.

The dynamism inherent in GEC governance also presents an opportunity for barriers to co-operation to be overcome as new dynamics are created. As Bulkeley and Newell (2010: 111) explain, "the landscape of climate governance is ever changing, and interesting and unpredictable alliances between actors, even former adversaries, are increasingly common". The fact that all government institutions rhetorically support co-operative governance, especially with regard to tackling CC, also provides a strong foundation for addressing co-operative constraints. Indeed, if recognised and addressed, obstacles outlined in this chapter can be transformed into opportunities for adaptation through increased networking and forging meaningful engagement over GEC and other relevant issues. This notwithstanding, tensions and trade-offs between competing policy agendas, developmental and environmental agendas and conflicting discourses and political priorities between all government spheres are difficult to overcome. Added to this, divergent and dynamic values, agendas and priorities between individuals in key government positions appear to be common dominant themes that can potentially undermine efforts at collaborative ventures for climate adaptation. The lack of regulatory frameworks and guidance for developing such collaborative networks for GEC/CC adaptation evidently poses an additional significant barrier to the development of such networked relationships.

Chapter 5 and this chapter have answered the first two research questions and thus addressed the first research layer. Incorporating findings from this layer, the next two chapters shift focus to finer scales where I explore perceptions and responses to climate variability (and by extension GEC/CC) and its likely effects within the local study sites in eThekwini and Ugu municipalities. The next chapter focuses on differential perceptions and understandings of GEC/CC amongst research participants and the key role of culture and religion in shaping these, while Chapter 8 charters divergent experiences and responses to climate variability and change amongst households and neighbourhoods in the diverse study sites.

Chapter 7: Differential understandings and perceptions of climate variability and change amongst households in diverse municipal spaces

7.1 Introduction

Chapter 5 compared Ugu (including ULM) and eThekwini local governments' responses to GEC/CC. I specifically emphasised challenges and opportunities confronting adaptation at these municipal scales and assessed disparities and similarities in the neighbouring municipalities' adaptive capacities. Chapter 6 advanced the analysis through investigating the relationship between Ugu and eThekwini municipalities and between these two municipalities and higher government spheres. Fundamental constraints to horizontal and vertical multi-scalar governance, such as ineffective communication channels and competing priorities and perceptions, were identified. Building on these investigations, this chapter shifts focus to the local scale and partly addresses the third key research objective: to explore the perceptions, understandings and responses to climate variability and change, and their impacts, within the case study sites. Chapter 8 addresses the third objective further and advances analyses presented in this chapter, through investigating differential experiences and vulnerabilities to climate variability between household and neighbourhoods across the socio-economic spectrum and in geographically diverse spaces. I also consider municipal − public relations in the context of addressing GEC/CC in Chapter 8.

7.2 Differing perceptions of climate variability and change across the socio-economic spectrum

As anticipated, from the outset of my empirical investigations it became clear that local perceptions, understandings, responses and vulnerability to climate variability (including climatic extremes) and change are highly differentiated, even within and between communities in very close proximity.[72] Comprehension of the implications of GEC/CC and predicted impacts on one's livelihood have a direct bearing on whether anticipatory adaptation takes place. Indeed, the way in which actors understand and frame GEC influences actions and types of climate policies adopted (Pielke, 2009).

[72] While there are overlaps between the two and their distinction is based on subjectivity, I follow Wolf and Moser's (2011: 548) distinction between perception: "views and interpretations based on beliefs and understanding", and understanding: "acquiring and employing factually correct knowledge of climate change". However, due to their overlaps they are, at times, referred to interchangeably.

SA's eleven official languages complicate the communication of GEC/CC information. Chapter 5 explained that according to several key officials and participant households, there is no direct translation for the term 'climate change' in the Zulu language, spoken by 80.9% of KZN's population and 23.82% of South Africans (Stats SA, 2001). In Zulu, the terms climate and weather are often used interchangeably (B1). In other words, the term climate change is directly understood to mean 'weather change'. Wolf and Moser (2011) underline similar findings in the Ethiopian context where weather and climate are used interchangeably, and the term climate is not widely referred to or understood. As such, terminological confusion arose as a potential obstacle to adaptation in the broader municipal contexts and beyond. Transmission of information needs to be sensitive to such social influences. To help overcome terminological confusion, the surveys and interviews were tailored to include questions such as, 'what do you think the main causes of the changes in the long-term *weather* or *climate* are', instead of only enquiring specifically about climate change. The issue of language barriers also points to the vital role of my Zulu-speaking translators to communicate questions in local vernacular, in a neutral manner (see Section 4.8.7).

As evident from the survey schedule in Appendix VI, various sets of questions were asked to identify participants' understandings of climate variability and GEC/CC ('Have you heard about CC? If so please explain'), its causes ('What do you think the main causes of the changes in the long-term *weather/climate* are'?), the likely impacts thereof, and implications for household livelihoods.

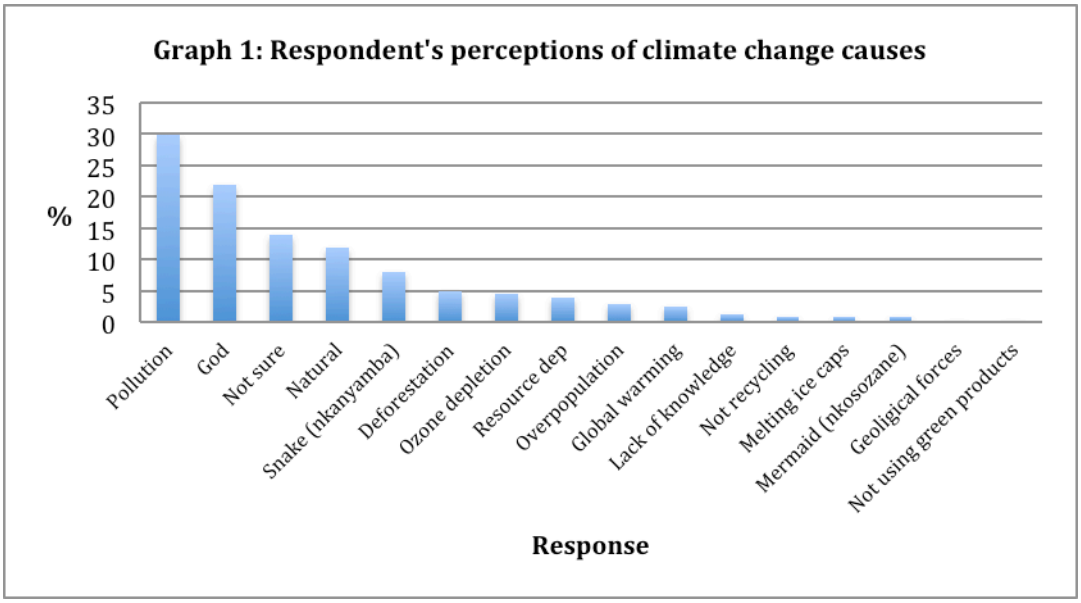
Most participants (87%) were broadly aware of GEC/CC. Yet, GEC/CC causes and likely impacts (including linkages between climatic hazards and impacts), as well as relevance to the SA context and individual lives in the context of differing vulnerabilities were, in general, not well understood. For example, interviewees commonly confused CC with global warming and the depletion of the ozone layer and often understood weather and climate as being synonymous. Similar findings have been revealed in CC-related studies in diverse contexts (e.g. Kempton et al, 1991; O'Connor et al, 1999; Bulkeley, 2000; Leiserowitz; 2005) while Wolf and Moser (2011) underscore the significance of this public misunderstanding after 30 years of large scale CC communication. Respondents cited television and radio as the two most popular information sources for learning about GEC/CC. Well-educated urbanites generally

revealed more awareness and understanding of CC and its causes than less educated rural and peri-urban dwellers. For example, 8/30 survey respondents in both Molweni and Ngcolosi had not heard of GEC/CC, while all Hillcrest households were aware of GEC/CC. Arguably, the greater awareness among Hillcrest households can also be attributed partly to the language barrier identified above, since all Molweni and Ngcolosi participant households were Zulu-speaking, whereas Hillcrest households were all English speaking. As surveys and interviews progressed it became clear that several of these households were familiar with GEC/CC, but not the specific term.

Awareness raising and education are strongly promoted by government and non-government officials (e.g. A1, B2, B3, E5, E6), and at the household-scale (e.g. I4, I8, I36, I40), as part of the solution towards adapting to climate variability and change. However, as illuminated below, education is but one (albeit an important) driver of differential understandings, since individuals and communities interpret experiences and phenomena through their *a priori* diverse cultural lenses in conjunction with other social factors such as gender and age.

Surveys and interviews contained questions pertaining to perceptions of change in the climate, and whether these perceived changes had, or would, amount to impacts on household livelihoods. These perceptions are important for assessing understandings of climate as it affects livelihoods and, in turn, justifying anticipatory responses and adaptation. Only 4.3% of respondents noted 'no change'. 50% of respondents felt that there has been an increase in temperature, 25% believed that storm and flooding events are more severe, while 18% felt that the weather has become more unpredictable. A further 16% felt that the seasons have changed (many noted that there are no longer distinct seasons) (see Table 8).

These viewpoints are shaped by household experiences and observations. However, while most households had *experienced* or observed changes in the climate and resultant adverse livelihood impacts, responses to such changes were evidently strongly shaped by people's *perceptions* of their causes and human ability to ameliorate or prepare for impacts. Importantly, many respondents held co-existing multiple, often contradictory beliefs about GEC/CC causes and actions. This issue is addressed in Section 7.4 below. In response to the question, 'What causes CC or changes in the long-term weather?', various reasons were given (see Graph 1).



As shown in Graph 1, 14% of respondents said they did not know the causes. In accordance with findings from similar research in different contexts (see for example Wolf and Moser, 2011 for an overview), the most cited cause was pollution, at 30%. Significantly, 'God' (22%) was the second most popular response, followed by 'natural' at 12% and the '*nkanyamba*' (mythical serpent discussed below) at 8%. In sum, these latter three responses amount to 42% of the survey total and each response implies that CC is created by non-human influences. Further, these perceptions of the causes of GEC/CC influence viewpoints about what types of actions can be taken to address GEC/CC (see Table 8 for the ten most frequently proposed actions). The two most commonly cited were 'reduce pollution/stricter pollution controls' (61/300), and 'government must take action' (40/300). Significantly, in sum, 68/300 believed 'no action' can be taken. Reasons for 'no action' included God being in control (30), CC as natural (19), the uncontrollable *nkanyamba* (11), factories are needed for

development/jobs thus they cannot be regulated (6) and it is too late to take action (2). A further 19/300 respondents suggested asking God for help/praying as an appropriate CC response.

Table 8: Ten most frequently suggested climate change actions in descending order

Suggested action	Frequency (out of 300)
Reduce pollution/stricter pollution controls	61
Government must take action	40
No action, God is in control	30
Education	29
Not sure	27
Revise planning	22
Ask God for help/pray	19
No action, climate change is natural	19
Can't control the nkanyamba	11
Factories create jobs thus shouldn't be regulated	6

In sum, almost 1/3 of respondents did not suggest any human actions for addressing GEC/CC. Thus, cultural and faith-based perceptions and other personal viewpoints have considerable implications for mitigatory and adaptive responses to climate variability and change in the study sites as explained in the discussions below. In addition, 'education' (noted by 29/300 survey respondents and 22/45 households interviewees) featured as a principal suggested CC action. The implications of attributing government responsibility for GEC/CC action are addressed in Chapter 8. The role of education for understanding and responding to GEC/CC was discussed in Chapter 5 and is further explored in Section 7.6 of this chapter.

Very few respondents differentiated between adaptation and mitigation. As evident from Table 8, the majority of suggested GEC/CC actions were mitigation focused (e.g. reduce pollution, recycling). Households did not appear to be as aware of the concurrent need for adaptation, nor how to adapt (adaptation possibilities) at the household and neighbourhood-scale. Thus, although both municipalities and higher government levels have identified adaptation as a priority, this does not seem to have filtered down to the household-scale to a significant degree. Evidently, local citizens need to be better informed about predicted climatic changes so that they can begin to adapt to them in

ways that are relevant to their specific socio-economic and locational circumstances. Yet, as the following empirical analyses reveal, information is one of many complex factors affecting adaptive understandings and actions.

The following section provides an analysis of the pivotal role of religious faith and cultural beliefs in shaping perceptions and responses to GEC/CC.

7.3 The things we believe: the role of religious and cultural belief systems in shaping understandings and responses to climate variability and change

Linked to education and awareness, the research findings underline the centrality of religious faith and cultural belief systems in shaping understandings and responses to climate variability and change. Political ecologists have long recognised the importance of accounting for the diversity of subaltern understandings and situated knowledges, which are often inadequately recognised in mainstream policy and discourses (Semmens, 2001) (see Chapter 2). Individuals and communities interpret and respond to GEC/CC experiences and phenomena through diverse *a priori* cultural lenses and frames of reference (Heyd, 2010).

Roncoli et al (2009: 97) explain that, "in many communities, weather and climate are understood as part of a universe infused with spiritual significance" and climate variability and change can be explained in relation to the violation of cultural, social and religious norms. Moreover, the sky is recognised as the 'domain of the gods' in many religious and traditional cultural narratives and texts, with GEC consequently being beyond human control or influence (Donner, 2007; Hulme, 2009; Mitchell, 2000). Therefore, "The notion that humans can strongly influence or be in control of the climate counters thousands of years of religious philosophy and existing traditional belief systems worldwide" (Donner, 2007: 232). This constitutes an important likely reason for delayed public response to CC threats in many contexts and can be linked to the dominant framing of the 'naturalness of disasters' and fatalistic worldview of many faiths (e.g. Hinduism) and cultures.

My empirical findings show that the implications of such beliefs for implementing GEC adaptation measures and building adaptive capacity are likely to be far-reaching. These significant findings are analysed in detail below, guided by the theoretical framework

elaborated in Chapter 2. I have found theoretical insights from PE, 'framings' literature and Swidler's (1986) 'cultural repertoire' useful for explaining the divergent and culturally infused understandings of CC that people hold. Importantly, guided by these theoretical insights and approaches, I am cautious not to 'reify' (or 'thingify', after Loftus, 2005) culture and cultural beliefs. Instead, I attempt to present them as crucial, yet, subjective aspects shaped and constrained by broader political-economic, structural and other constraints within which they are constructed.

7.3.1 'It is all up to God' – the connections between religious faith and CC perceptions and responses

Bankoff (2004b) confirms that the notion of a divine power controlling forces of nature and the expression of a 'vengeful deity' permeate Judaeo-Christian perceptions of the universe. These images or frames have been attached to the worldwide spread of Christianity and fused with "local belief systems in the Third World to create syncretic explanations of these local phenomena" (2004: 91). Section 7.2 explained that 22% of survey respondents (only 9% lower than the most popular response of pollution at 30%), believed that God is the principal cause of CC. Many research participants, particularly in rural areas and townships, notably amongst Indian and African communities, relate changes in the weather and climate to God and believe that only God can influence the weather and climate.

SA has a broad mix of religions, with the predominant religion being Christianity (79.8%), mostly Protestantism (Stats SA, 2001). It is noteworthy that the figure of 22% actually underemphasises the significance of religious beliefs among my study population in motivating responses and shaping perceptions. Indeed, during in-depth interviews and informal discussions, I discovered that many respondents who did not mention God as the cause of CC or extreme events in response to the specific survey or interview question, *did* strongly believe in the power of divine influences in shaping CC impacts, from increased temperatures to extreme weather. For instance, "Maybe all these extreme weather events and the heat is God's way of controlling all our population and other problems" (I2). Further, many participants who stated CC to be 'natural' (12%) later clarified that by 'natural' they meant associated with God. Additionally, as illustrated by I2's response above, many respondents believed that God was the cause of or had 'sent' the extreme events that they had experienced.

While admittedly shrouded in complexity and evading simplification, the expressed religious viewpoints can be divided into two broad categories: fatalistic and potentially proactive/precautionary. From a fatalistic viewpoint, God controls both causes and impacts of GEC, thus often overlooking other vulnerability factors and anthropogenic drivers of GEC. Such viewpoints are represented in the responses outlined in Box 7. The response of S22 from Kwamakhutha (Box 7), which alludes to the biblical prophecy of the end of the world or the second coming of Christ, reflects a commonly cited fatalistic viewpoint.

Box 7: Fatalistic viewpoints

> I think God is very cross with us, we are doing many bad things and he is punishing us with this weather he is sending. There is nothing we can do, it is in his plan (Molweni, S14).
>
> Some people survived that flood only by the grace of God, they prayed to him (Ngcolosi, S12).
>
> God is handling the weather, it is what he wants to happen so how can humans do things against that? (RSP, S26).
>
> It's God, it is the end of the world. The storm that came in this area was one of the signs that God is coming to finish everything (Kwamakhutha, S22).

While PE and political economy theories underscore the social and structural influences shaping disaster events, the 'Act of God' discourse persists in many quarters, not least in the insurance industry, politics and mass media (Hulme, 2009; Bankoff, 2004b). Moser and Dilling (2007) argue that when CC is reported in the media with accompanying images of large scale weather disasters – as is the predominant case in SA and globally − the 'Act of God' framing (linked to fatalistic viewpoints) becomes further entrenched and reinforces a sense of disempowerment and disbelief in human causation or ability to solve the problem. Adverse GEC policy and practice implications of such framings could be far-reaching, as detailed in the Sections that follow.

Conversely, from a potentially proactive/precautionary viewpoint, God controls the weather and extreme events, yet actions can be taken to avoid or reduce impacts. As I40

from Sezela Informal explained, "God holds the power. If he wants it to flood, it will; if he wants the sun to shine, it will". However, when asked whether any actions can be taken to address CC, the same respondent showed support for proactive actions as follows, "we must stop building houses in damp places and near rivers and make sure to build strong houses." This response also points to the complexity of belief systems where multiple, sometimes contradictory, beliefs regarding the same issue often comprise cultural toolkits. This issue is discussed in detail below. A second strand of the potentially proactive viewpoint relates to the understanding that society needs to take responsibility for its actions and care for the Nature that God has entrusted humans with as evident in I10's explanation,

> Floods will happen by God's power but we have a role to play in how these affect us. We need to care for our environment; God put us in his garden to care for it, but we must also understand that He is in control. But we don't understand the limits, we want to be God.

There is a considerable body of literature on the relationship between religion and nature (including weather and climate), where the influence of specific religious affiliation is often addressed (e.g. Mitchell, 2000; Bankoff, 2004b; Taylor, 2004). I did not probe interviewees' specific religious faith as it was seen as a sensitive aspect. However, the empirical results underline the strong influence of beliefs in divine powers, regardless of religious affiliation, in shaping perceptions and responses to GEC.

7.3.2 Implications of religious faith for GEC/CC policy and actions

A major consequence of religious faith is that fatalists might be disinclined to take actions and adapt to protect themselves from climatic events, thereby leading to maladaptation. Another consequence is the deeper entrenchment of dualistic framings criticised by PE. Further, both the first strand of proactive, as well as fatalist believers may be averse to mitigatory (e.g. reduce pollution) as well as adaptive actions (install flood defences), given supposed human powerlessness in influencing CC causes and impacts. 10.3% of survey respondents indicated that 'God' is *responsible* for taking action against CC (i.e. only God can control the climate) rather than 'government' or 'everyone', which were the two most prominent responses in this category. While some believed God to be the cause of drought, floods and other CC impacts, others also viewed God as their *protector* against CC impacts, thus precluding the need for and questioning the effectiveness of anthropogenic adaptive actions. As the quotes in Box 8

show, some respondents perceive God as controlling CC *causes*, as well as *providing protection* from GEC/CC impacts:

Box 8: God as the controller of CC causes and protector from CC impacts

> We can't do anything, we must pray to God to reduce this pollution. I think my house survived the storm because of the prayers I made (S22, Molweni).
>
> We chant when there is an obstacle like during that huge hailstorm: we were so frightened, but we started to chant for help. Those kinds of storms are more frequent now and we will continue to do that to help us (I14).

The above quotes also reveal that religious faith creates a sense of security for some believers who draw on their faith to cope during times of stress.

From a positive stance, religious faith can potentially support adaptive capacity through the sense of community and support of belonging to the same faith group or holding similar religious viewpoints. However, as alluded to, this argument may not apply to fatalist believers who may exhibit maladaptive behaviour. In sum, barriers associated with religious faith may outweigh facilitators in some cases. Despite being a principal factor in shaping experiences of climatic variability and extremes, the role of religious faith remains inadequately accounted for in the development of GEC measures and DRR, particularly at policy scales. Further, religious leaders remain on the margins of mainstream GEC debates, education and development of adaptation measures (Hulme, 2009). As exemplified throughout this discussion, these arguments apply to the SA context and more broadly. This notwithstanding, academic and policy circles have recently begun to emphasise the role of religion and faith based communities whose prominence and involvement in motivating CC action is growing apace (Bingham, 2007; Hulme, 2009; Wisner, 2010; Wolf and Moser, 2011).

Significantly, the NCCR Green Paper (2010: 30) underscores the role of faith communities as follows,

> …. the faith communities have an important role to play in continuing to raise public awareness and motivate individuals, institutions and authorities to take actions to reduce greenhouse gas emissions and adapt to the adverse impacts of climate change as well as to critically evaluate, comment on and respond to the initiatives of government and the private sector.

However, curiously and ominously (in light of my empirical findings), this significant policy discourse has been omitted from the NCCR White Paper (2011). While the justification for this is unclear, a notable caveat is that religion is a highly sensitive topic, which evokes deep emotions and its role in facilitating CC action is not without ambiguity and contestation. Religion, politics and CC are a complex combination. For instance, since CC is a deeply political issue, Reverend Bingham (in Moser and Dilling, 2007) cautions that there is a fine line between mobilising citizens around CC – infused with ethical, moral and justice issues that resonate closely with predominant religious beliefs – and being viewed as a political campaigner. This may be one of the reasons for the White Paper's omission of the topic. SA's cultural heterogeneity and the influence of culture on CC decision-making also do not feature in the legislation.

Based on these substantial findings, I argue that much more attention needs to be paid to investigating the influence of religion on perceptions and responses to GEC and the linked implications for adaptation. This is especially important, since, in addition to recent legislative omissions, no key government or non-government interviewees in my study sites underscored the role of religion in environmental or CC issues. While this argument is based on my empirical findings in the research context, it applies throughout the global North and South as faith-based organisations and beliefs are universal. Other belief systems, notably cultural beliefs, are held in conjunction with religious beliefs. In other words, these are always transforming and articulating with other worldviews. Globally, extreme climatic events and weather in general are infused with folklore, myths[73] (e.g. sea serpents and monsters) and belief in supernatural powers. Such belief systems also strongly influence how communities respond to CC events and these are discussed in the following section.

7.3.3 'It was the *nkanyamba* that caused that storm': the centrality of cultural frameworks for GEC/CC perceptions and responses

In KZN, cultural frames and symbols play an important role in shaping people's understanding of CC. Thus, in addition to faith-based beliefs, many respondents of

[73] Similarly to Hulme (2009: 341) I use the term 'myths' not in the common way of implying fallacy, but in the anthropological sense of beliefs and discourses that "embody fundamental truths underlying our assumptions about everyday or scientific reality".

different age, gender and education levels belonging to the Zulu and Xhosa[74] cultures attributed extreme events, changes in the weather and CC to supernatural forces such as divine mythical beings and ancestors.

The *nkanyamba* (mostly envisioned as 'the snake'), which is associated with destructive tornadoes, was the most commonly cited mythical being. As a Sezela resident (I44) explained, "ooooooh all these storms we have been having, they are to do with the big snake; he must be very angry to cause this much damage". The *nkanyamba* is a creature of storm and wind and the term refers not only to a climatic phenomenon (usually a tornado) but "embodies the tornado spirit itself" (Wood, 2000: 82). It is important to reiterate that many respondents conflated CC, weather and extreme weather events. Thus, the *nkanyamba* was attributed to all three phenomena and it was sometimes difficult to distinguish which phenomena respondents were referring to.

Explanations of the *nkanyamba's* powers, appearance and origin vary in participant accounts and limited literary sources. Importantly, the *nkanyamba* assumes different characteristics through place- and time-specific interpretations, often adapted for local relevance. Many respondents believed that there is more than one *nkanyamba*, while only a few believed in a single *nkanyamba.*[75] Some interviewees reported that recent generations had discovered the being, while others explained that it has much deeper historical roots. Anthropologist Brian Siegel (2000) explains that the antiquity and foreignness of supernatural beings in the form of mermaids, snakes and so forth are open to various interpretations in the African context. There are several other mythical African aquatic and land-based creatures or supernatural beings associated with climatic phenomena such as the *nkosozane* or *mami wata* (mermaid) and the lightning bird, *mpundulu* (Wood, 2000; D2; D3). The southern African region houses cave paintings of large snakes, which archaeologists liken to the *nkanyamba*, labelling them 'rain animals', as they are always associated with storms (Metareligion, 2011). Possibly, the *nkanyamba* can be linked to ancient mythology where snakes feature prominently, often in association with water bodies (Eberhart, 2002).

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[74] The majority of African households and individual respondents belonged to the dominant KZN Zulu culture, however several participant households were Xhosa speaking and often held similar views to Zulu households regarding the *nkanyamba* and other mythical beings.
[75] While there is ambiguity over their population, the term '*nkanyamba*' appears to apply to singular and plural references.

According to various household interviewees and limited documentary sources (e.g. Wood, 2000; Eberhart, 2002), the snake is aquatic, living in deep water and is able to fly through the air, often in search of its mate, which may live in a deep pool or dam, or to relocate when it has babies. Different communities hold various beliefs as to where the *nkanyamba* lives. The *nkanyamba* has been linked to dangerous water pools below Howick Falls, situated inland, north of Durban (Eberhart, 2002; Beaver, 2011). However, none of the research participants cited this location and instead mentioned nearby or personally familiar sites such as Inanda dam, as a key *nkanyamba* location. The *nkanyamba* was variously described, from having one to several heads, with some noting wings and a horse-like head as key features and most claiming that it travels in dark storm clouds as a disguise. Some allege to have seen the *nkanyamba* and others say it is invisible. Generally, the snake is believed to be most active during the summer months when it causes severe storms and tornadoes in anger of not finding a mate, being tricked by shiny or blue roofs, which look like water from a distance, or when water bodies cannot accommodate it. Tellingly, the *nkanyamba's* most active months coincide with the rain and storm season associated with the regional climatic trends. While there are several variations in specific details, respect and fear of the *nkanyamba* and its destructive tornado-like powers were common to all believers: "When the storm comes it is bad, but if the *nkanyamba* comes too, shoooo, well then it will be much *much* worse, I fear to think of him" (S9, Molweni).

7.3.4 Encountering the *nkanyamba* in the case study sites

On 14 November 2008 the greater Molweni and Hillcrest areas were struck by a severe storm event with high winds. The event, described locally as a 'tornado', was short lived, localised and devastating. Nine deaths were reported, numerous homes were destroyed and many people injured in Molweni (eThekwini municipality, 2008). Private and public property damage was also caused in the nearby upmarket Hillcrest area. The event received widespread news coverage and was a catalyst for eThekwini's former Mayor's subsequent fervent support for CC action in the municipality (KwaNaloga Roundtable Discussion, 30/10/09). Significantly, formal accounts of this and other KZN extreme storm events (e.g. eThekwini municipality, 2008; Magwaza and Mfusi, 2008) do not recognise that many Molweni citizens attributed these to the powers of the *nkanyamba*. D3's descriptive account in Box 9 reveals some Molweni citizens' perceptions and experiences of the event.

Similarly, several Zulu respondents in Kwamakhutha attributed the devastating storm event (which also caused loss of life, injury and property damage) that occurred in the area in December 2008 to the *nkanyamba*. This is exemplified in D2's (a local youth leader's) recollection in Box 9.

Box 9: Respondents' accounts of the *nkanyamba*

D 3: The story of the *nkanyamba* became clear a few years ago at the place near Hillcrest called Molweni on that day that it swept through in a tornado cloud. There was devastation, total devastation. I have family there so as soon as I heard the news I rushed over there, I couldn't believe it. I have witnessed with my own eyes the destruction it causes, you wouldn't believe it. You could actually see the path it had followed, those houses in its pathway were flattened totally. HL: Have you or anyone you know seen the *nkanyamba*? D3: I have not, but I questioned the people in the area and they had seen it that day, definitely. Some described it as being a huge black snake with several heads. It travels from one place to another just like a tornado.

D2: There is something more to these things than we think or see. In my culture, a lot of people believe this. You remember, for instance, that big storm in 2008? I remember I looked up and you could see there was definitely something more inside than clouds, it was so dark and moving quickly. That was the snake, because if you think about it, it was just that huge black cloud that came so fast and rain was only coming from that cloud, it was the snake in that cloud and it was clear.

Significantly, the *nkanyamba* was referred to in all study sites, in both municipalities, by Zulu- and Xhosa-speaking residents.

Another important aspect to note is that several respondents linked their vulnerability to CC/GEC impacts to the *nkanyamba's* power and actions. For example, proximity to Inanda dam (near Ngcolosi and Molweni study sites) may exacerbate vulnerability to GEC/CC impacts, such as extreme storm events and flooding since, according to some, the *nkanyamba* lives in Inanda dam. As an Ngcolosi resident (29) noted,

> We are near the dam and the snakes want to come inside the dam; like the dark cloud that came past Molweni during that storm and ended at Inanda dam, which means that the snake landed in the dam, but when others try and come there again bigger storms will happen.

When explaining what determines household vulnerability to GEC/CC, another respondent professed,

> We are at risk of the big snake 'cause the material of the houses here are shining like a dam. Other people painted the roof so it will not shine. You can't see the *nkanyamba,* though, because it is flying with the dark cloud. If it flies it causes damage to houses, trees and causes floods (I2).

Local communities may thus resist installation of adaptive and mitigatory temperature control and energy saving measures, such as reflective roofing material. Local authorities and other 'outsiders' can only understand the justification behind such potential resistance through meaningful local collaboration. Related to these vulnerability viewpoints, several respondents also felt that 'disobeying God' increases vulnerability to CC and weather extremes.

While the *mpundulu* (lightning bird) was not referred to, several respondents referred to the *nkosozane* (mermaid), which appeared to be feared and respected in a similar way to the *nkanyamba*,

> The *nkosozane* has big powers and is dangerous. If she is out the water she will cry and her tears cause the big storm. People believe that if the *nkosozane* is fished instead of other fish the weather changes quickly because it is not allowed to be out of water and it gets upset. The *nkosozane* is like a lady in her body and her legs are like a fish. She also caused those big waves in 2007 when the whites fished her (I43)

Witchdoctors and ancestors are also dominant figures in SA society − particularly for Zulu communities − which are believed to have extreme powers. Research participants noted witchdoctors' ability to control the weather: "There is a well-known witchdoctor in Umbumbulu. He can control the weather, and if he wants it to rain it will and if he doesn't it won't" (D2). Regarding the significant force of ancestors, respondent S5 from Molweni explained that, "These things are happening because our ancestors are angry with us. We need to appease our ancestors, we need to go back to our roots".

In short, my empirical findings underscore that traditional folklore and other socially constructed perceptions of extreme events and related risks can have a far-reaching influence on vulnerability and adaptation to GEC in the SA context and more widely. As with religious viewpoints, cultural beliefs about GEC/CC can be categorised broadly as potentially proactive/precautionary or fatalistic. As such, cultural and social frameworks often result in a sense of disempowerment and inaction relating to extreme

events and climate variability and change. This argument is substantiated by the aggregated survey responses outlined in Section 7.2, above where I noted that, mostly due to faith-based and cultural beliefs, 68/300 respondents felt that no societal CC/GEC actions are necessary, as well as in the absence of household level adaptive or mitigatory GEC/CC measures.

Sceptics or naysayers might interpret these folkloric understandings as nonsensical and perhaps argue that long, dark storm clouds have been mistaken as the travelling *nkanyamba*. As an aquatic being, it has also been suggested that the *nkanyamba* might be a large eel species (Eberhart, 2002). Nevertheless, beliefs about *nkanyamba* and other supreme beings have been passed on through several generations and constitute reality for many people, formed by the cultural context with which they ascribe meaning and value to what they see and know.

However, to my knowledge, the implications of beliefs in such supernatural powers have not been investigated or accounted for meaningfully in the development of CC policy and actions in the study contexts and more broadly. Culture and religion were not raised as main concerns for GEC adaptation amongst key officials, nor do they feature prominently in emerging CC policy. Only four local government representatives (A1, A8 from eThekwini; B1, B2 from ULM and Ugu respectively) and a WESSA (E3) representative underscored the importance of accounting for cultural beliefs in the development of adaptation measures. Empirical data presented in Chapter 5 revealed that certain municipal officials (e.g. B5 and B6) felt that when high-level officials publicly express their culturally informed and traditional beliefs (such as the need to appease ancestors to prevent to prevent CC and extremes) it serves to reinforce similar beliefs held by the local public. Interestingly, most government official interviewees who strongly recognised the role of cultural beliefs in shaping CC responses were linked to the cultural groups where such beliefs predominate. This reveals an extent of inadequate cross and inter-cultural understanding, which applies not only to government officials but broader society as well.

While not focused on GEC/CC associations, I discovered a few rare formal literary accounts of the *nkanyamba*. For instance, Felicity Wood (2002) explains in her English literature paper that Xhosa residents in the Hogsback area of the Eastern Cape, SA,

commonly associate a 1998 tornado with the *nkanyamba*, which local sculptors have portrayed in their clay statues. Moreover, in a likely link to the *nkanyamba*, Oelofse (2002) explains that, according to the Zulu culture, a large snake is found in the quarry near Canaan informal settlement in Durban. A landslide occurred in this settlement and local residents believed that the angry snake relocated to a different quarry, thereby causing the land to slide (Oelofse, 2002).

A possible explanation for the dearth of theoretical and policy attention is that information regarding the religious interpretations, myths and folklore that inform conflicting belief systems are often not recorded in written form; rather, they are orally communicated (Burroughs, 2003). This makes it difficult to trace these understandings to be accounted for in adaptation decision-making and reinforces the need for increased community participation and deliberative governance.

On 2 October 2011 (when I was nearing completion of this Chapter), a powerful tornado ravaged the predominantly low-income town of Duduza in southeast Johannesburg (Gauteng Province). After rarely encountering any documented news and other reports of the *nkanyamba's* powers during and before my fieldwork, *News 24*, a major SA online news source, published an article on this tornado event, titled "Duduza tornado 'like a snake". The story reports that a Duduza resident, Mr Foster Mhlathi, exclaimed, "It was like a snake with big eyes and its figure was made from the cloud" (*News 24*, 03/10/11). In addition to this quote, which illuminates the pervasiveness of this belief beyond my study sites, the responses to the article, posted by anonymous readers, encapsulate powerfully the highly contested and sensitive nature of this and other culturally informed beliefs. One particular exchange, detailed in Box 10 (copied directly from webpage), captures these aspects and reiterates my argument about the importance of considering such strongly-held beliefs in developing adaptation measures across the SA context and more broadly. This and one additional full news article covering this event are provided in Appendix VIII. These articles' references to poor-quality RDP housing leaving households more vulnerable to extreme events and lack of faith in government also resonate closely with my empirical results analysed in Chapter 8.

Box 10: On-line comments posted by readers in response to Duduza tornado news article

morena - October 3, 2011 at 14:45
Report comment

ohhh my God that tornado hit the wrong place, now we going to hear endless nonsense from locals there telling us it was a snake, witchcraft, the witches were moving their oven all this rubbish and hey I'm black I don't believe all this nonsense.

thank goodness my father refused all this mambo jumbo when he was 15 when his father tried putting him into this rituals. If he didn't do that i would probably be saying yes it was a snake and i saw it when it took my neighbour's kids to the underwater sea…

purevirgo - October 5, 2011 at 13:04
Report comment

Morena, dont ever ridicule or make a joke on someone's belief no matter how myopic you want it to sound….That woman saw a snake, she surely had not smoked any ganja.I have heard this story before that inkanyamba is some snake when it moves it rolls in clouds no one can see it. Its chaotic episode takes less than 15 minutes but has serious ramifications. OLDER FOLKS KNOW THIS, PLEASE BACK THE LADY UP BEFORE SHE IS ACCUSED OF BEING SOME LUNATIC. If you FOLLOW STRANGE climate record disasters, you will note that a mermaid was fished two years back from DURBAN. Was it a myth or the truth. graves were ripped opened,skeletons washed away. the Indian ocean got into storey buildings , what was that? Morena get off your high horse, please.

Source: Copied from *News 24* (http://www.news24.com/SouthAfrica/News/Duduza-tornado-like-a-snake-20111003)

7.4 Multiple realities: the complexities of our 'cultural toolkits'

Importantly, people's realities are more complex than the analysis has portrayed thus far. As epitomised in I40's response quoted above, many individuals hold various and sometimes contradictory beliefs about GEC causes and impacts. Drawing on 'framing' literature and Swidler's (1986) 'cultural toolkit', Chapter 2 explained how the same issue might be framed in multiple, sometimes even contradictory, ways depending on the context and intended outcomes. Moreover, manifold social influences constantly impact on our actions and perceptions, thereby creating multiple framings on various issues (Swidler, 1986; Moser and Dilling, 2007). While expressing beliefs about fate, the will of God or other supernatural forces such as the *nkanyamba*, many respondents concurrently noted GEC causes such as pollution and deforestation and the role of location (e.g. floodplain) in shaping vulnerability to CC impacts. As exemplified in I8's response: "God is doing it, if he wants to give rain he gives it, if he wants to give sun he will give sun. But if we reduce pollution it will also help".

Further, informed by their diverse cultural repertoires, many respondents believed that divine and supernatural forces control CC and extreme weather, yet concurrently noted that the government is responsible for taking action to address CC. Arguably, through assigning government responsibility respondents have framed their discourse in an opportunistic way to link with mainstream discourses, possibly in the hope that some sort of government-initiated development benefit may follow. As Swidler (1986: 277) explains, "cultures contain diverse, often conflicting symbols, rituals, stories and guides to action". People employ their diverse cultural framings in purposeful and often skilled ways in different circumstances, for constructing different strategies and arguments in pursuit of intended outcomes. Evidently, understandings and responses to GEC/CC are shaped by a fusion of beliefs. This fusion incorporates traditional African ways of seeing, 'western' culture, 'scientific knowledge' acquired through formal education and mainstream media. These 'melting pots' of belief systems do not translate to a common agenda for understanding and action, thereby underscoring the inappropriateness of blueprint GEC strategies. Nevertheless, because knowledge is formed through multiple sources and culture is dynamic, cultural and religious beliefs can co-exist with 'new' knowledge about anthropogenic drivers of CC causes and impacts, such that precautionary actions may be taken and adaptive capacities strengthened without undermining these co-existing, somewhat contrasting beliefs.

GEC/CC evidently, has a direct interrelationship with human culture. In accordance with Heyd's (2010) and Swidler's (1986) views, my empirical research findings illustrate clearly the significance of cultural frameworks or repertoires in shaping conceptualisations of environmental phenomena and in turn behavioural patterns and adaptation to GEC/CC.

At this juncture it is important to address the ongoing debate in development studies and other disciplines about the separateness and seperability between so called scientific, traditional, indigenous, and indigenous technical knowledge (ITK) or ways of knowing, as well as their relation to cultural and religious beliefs.[76] The growth of the large body of theory and practice from the 1970s onwards on local knowledge (incorporating local

[76] There is no universal agreement on the definition of traditional knowledge, or the appropriateness of delineating knowledge categories in this way. However, as a guide, Berkes et al (2000: 1252) have defined traditional knowledge as a "cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (humans) with one another and their environment".

perceptions and practices) in development, PE and other fields represents a shift from pervasive technocratic and centralised approaches that characterised past decades (Agrawal, 1995). This shift has occurred largely under the post-structural umbrella, including postcolonialism where plurality or multiple knowledges, rather than a single 'truth' in general are emphasised (see also Section 2.7-2.8.2). In addition to my SA based findings, recent studies in diverse contexts such Uganda (e.g. Orlove et al, 2010), Australia (e.g. Bulkeley, 2000; Green et al, 2010) and the Arctic (Riedlinger et al, 2001) point to dynamic local climatic and other knowledge systems that are open to and can be complemented by other information (see Wolf and Moser, 2011 for a synthesis).

Wolf and Moser (2011) explain that, in CC research, local traditional knowledge and experience of weather and climate are often applied to complement and verify scientific data, for example, in the Arctic region. However, Agrawal (1995) questions the validity and sensibility over the indigenous/traditional versus scientific/rational knowledge dichotomy on various grounds. He states that the classification may not be beneficial to marginalised minorities and is bound to fail due to "heterogeneity among the elements" and "because different indigenous and western knowledges possess specific histories, particular burdens from the past, and distinctive patterns of change" (Agrawal, 1995: 421). In essence, he argues that such knowledges can never be separated and fixed in time and space, or be seen as untouched by each other. This argument forms part of the wider ongoing debate within PE where it has been argued that privileging the local simply replaces the modernist with a neo-populist hegemonic discourse (Neumann, 2005).

In response to these and Agrawal's (1995) strong arguments, and based on a hybridity study on environmental degradation in Thailand, Forsyth (1996) contends that the classifications retain usefulness in the sense that western assumptions and scientific enquiry can be tested by local knowledge and vice versa, which can thereby increase the status of marginalised minorities in environment and development policy. These debates remain unresolved and are likely to remain this way, because they are based on subjective and diverse theoretical standpoints. This notwithstanding and in accordance with Swidler's (1986) cultural toolkit framing, my empirical results point to the considerable overlap or fusion between cultural and religious beliefs and other knowledge systems which co-exist (sometimes in tension) and have been developed

through many generations. Developing policy and practice that avoids spatial, temporal or cultural bias is an ongoing challenge. Central to this challenge is the increased inclusion ad recognition of marginalised minorities, each with their own complex knowledge and belief systems, in policy development.

7.5 Incorporating cultural and religious beliefs into GEC adaptation

Importantly, political ecologists strongly recognise the economic, social, political and environmental embeddedness of individual viewpoints, discourses and actions. Certainly, as Heyd (2010) agrees, risky or maladaptive behaviour is also attributable to interconnected factors such as economic and social marginalisation. Thus, it is important not to overstate the influence of cultural and religious beliefs and to account equally for co-existing factors underlying vulnerability and adaptive capacities. Nevertheless, in some instances, the influence of people's cultural frameworks can be a key risk-driving factor. Cultural norms impact on the spatial and social distribution of risk (Pelling, 2003). Succinctly put, "culture may be one of the most important characteristics for some societies, where culture alone may decide whether the people will be adversely affected by climate change or disaster risk" (Schipper, 2009: 2). This points to the necessity of involving communities in the development of adaptation measures since "change should be developed from within cultures rather than from without" in order to be effective (Ensor and Berger, 2009b: 230). Asserting this, the two faith organisation leaders whom I interviewed affirmed the potential for 'bridge-building' (after Hulme, 2010), between religious, 'scientific' and other belief systems. These aspects need to be understood better since, "Culture evolved alongside society's ability to live with change in the past, and thus must be central in living with change in the future" (Coulthard, 2009: 264).

It is clear that cultural and religious beliefs and linked narratives and myths can exacerbate or attenuate vulnerability to GEC and act as motivators for GEC/CC action or inaction. However, I argue that focus should be on the opportunities created by shared religious and cultural beliefs as a platform for engagement and collaboration over CC issues, as well as a fundamental social resource for fostering community cohesion. While it is important not to romanticise local knowledge, if culturally informed perceptions and understandings of GEC/CC are overlooked in the development and implementation of adaptation measures, they may be ineffective and

resisted, thereby inadvertently contributing to maladaptation. Therefore, local authorities and other key stakeholders need to account for folkloric or traditional beliefs and perceptions, including religious beliefs discussed above when introducing or promoting new ideas about effective adaptation measures. Moreover, as also shown throughout Chapter 8, people have varying perceptions about caused of vulnerability to GEC/CC and how to address these. In other words, the causes and impacts of GEC need to be understood from the perspective of the people/communities experiencing the event and not simply from the view of outsiders involved in developing adaptation measures (Kasperson et al, 1998; Oelofse, 2002).

This can be achieved only through effective deliberative governance and can be supported by the starting-point or systems-based approach to vulnerability, which is concerned with identifying existing vulnerability influences and considering the implications of these for future vulnerabilities and adaptive capacities (see Chapter 2). Chapter 2 explained the significance of 'cultural resonance' for issue framing. In light of the analysis presented above, I argue that GEC/CC debates and education need to move beyond exclusively politically and scientifically dominant framings and be *reframed* in culturally relevant ways to be meaningful to local people and to motivate adaptive actions. Mainstream engagement with philosophers, theologians, traditional authorities and locally influential individuals such as *sangomas* (witchdoctors) in the SA context is pivotal.

Disaggregation of data also reveals important insights into the uneven spatial/geographic and demographic concentration of religious and cultural influences. Folkloric perceptions of GEC/CC were exclusive to households belonging to the Zulu culture. These households were concentrated in the Ngcolosi, Molweni, Kwamakhutha, Thokoza and Sezela Informal study sites. While religious beliefs were expressed in most research sites, they were most prominent in the RSP and Ghandinagar Indian communities. These spatial and demographic characteristics of belief systems need to be incorporated into the development of adaptation measures and considered in conjunction with co-variate vulnerability influences.

Arguably, the above religious and cultural beliefs reinforce and are reinforced by the pervasive nature/culture dualistic ideology (see Chapter 2). The potentially disabling 'separability doctrine' has influenced societies to treat nature and culture/society as

separate and separable realms as opposed to interdependent systems (Proctor, 1998; Heyd and Brooks, 2009). This binary thinking prevents "the internalization of relations with the non-human environment into everyday life, political discourse and policy formulation" (Heyd and Brooks, 2009: 279). Increased awareness of the interdependency between nature and culture or human and non-human systems (i.e. social-ecological systems) is urgently required for adaptation measures to succeed. It therefore follows that cultural frameworks should be incorporated into environmental decision-making processes (including CC mitigation and adaptation) in order for this separatist ideology to be overcome (Heyd, 2010) and it is this approach that this thesis supports. As such, it is not simply infrastructure, food production and other widely cited aspects that need to be adapted to deal with CC, but enduring belief systems. However, formidable challenges remain since the 'science' of anthropogenic CC is relatively new and somewhat abstract to society, whereas religious and cultural systems are millennia old and emotionally charged, contentious issues.

7.6 The role of education and information in shaping understandings and responses to GEC/CC

Along with the socio-cultural influences already examined, education levels arose in my surveys as a central determinant of the depth of CC understanding and, by extension, an important vulnerability indicator. Education levels among different households and communities are determined by past injustices (e.g. discrimination based on race and gender) and present influences such as affordability, proximity to schooling, household priorities and opportunity (Marais, 2011). Education about GEC/CC has a direct bearing on vulnerability and adaptive capacity because, without knowledge about projected changes in climate and the likely adverse impacts, as well as emerging CC legislation, individual and collective ability to make anticipatory adaptations, together with community support for government-led initiatives will be undermined.

Education about GEC/CC was highly valued by respondents since 'lack of education and understanding' (30/300) was the third most cited vulnerability driver and lack of CC knowledge was seen by many interviewees (e.g. I8, I20, I27, I33, I45) as a key constraint to CC action and protecting livelihoods from CC impacts. Moreover 29/300 (fourth highest response in category) survey respondents noted 'education and more information' as the most appropriate action for addressing CC (see Table 8). For the

most part, local stakeholders from both municipalities showed eagerness to learn more about GEC/CC and the implications for their livelihoods. As exemplified, there was very little evidence of adaptive actions within urban and rural households and this is *partly* due to lack of understanding about necessary and appropriate adaptation options at the household level. Improving access to climate information and greater GEC/CC education are important adaptation strategies. As already explained, adaptation in different households and localities reflect particular socio-cultural and politico-economic circumstances. As such, information and education needs to be sensitive and relevant to citizen's everyday realities or life worlds and communicated in appropriate language. Here, as with Scott et al (2011), I propose the need for greater information for increasing knowledge bases upon which to make everyday life choices in the context of GEC/CC, not in the sense that it would or should necessarily lead to behaviour or attitude change.

In agreement with similar research findings from various contexts (e.g. Bulkeley, 2000; Orlove et al, 2004; Leiserowitz, 2007; Weber, 2010; Scott et al, 2011), and in contrast to the pervasive 'information or public deficit model/approach', I argue that lack of information is but one of many factors shaping (in) action on CC and communication about CC is not simply about filling gaps in public knowledge. The information deficit approach is linked to the increasingly critiqued 'linear model' of science-based policy-making since its underpinning hypothesis is a one-directional transmission of information from science to policy (Eden, 1998, in Scott et al, 2011). This model also resonates with first-generation adaptation research.

7.7 Conclusions

Chapters 5 and 6 explained that SA government policy discourses concerning CC education and information provision are largely based on the rationalist public deficit model. Contrasting this approach, my research shows that the relationship between understanding or perceptions of GEC/CC and action is constructed through a range of multiple co-existent institutional, socio-cultural and other factors such as perceived individual efficacy in affecting large-scale problems such as CC. To reiterate, public understandings, beliefs and actions relating to CC are also representative of deeply held beliefs about the relationship between nature and society (Bulkeley, 2000). Regarding

my empirical findings, the ‘environment versus development’ viewpoint and deeply held cultural and religious beliefs centrally influence this relationship.

This chapter has addressed the third research objective through exploring differing perceptions and understandings of climate variability and change and its likely effects within the case study sites. One of my major arguments is that understandings and perceptions of the causes, as well as implications of GEC/CC and predicted impacts on one’s livelihood, have a direct bearing on experiences and responses to GEC/CC and whether anticipatory adaptation takes place. Building on the empirical analysis presented in this chapter, the following final results chapter explores divergent experiences and responses to climate variability and change amongst participant households and neighbourhoods. Differential vulnerabilities and adaptive capacities are examined through applying the second-generation approach to adaptation and drawing from key PE insights.

Chapter 8: Divergent experiences and responses to climate variability amongst households and neighbourhoods in the case study sites

8.1 Introduction

Chapter 7 explored differing perceptions and understandings of climate variability and change and the likely effects thereof within my study sites. Various aspects, particularly religion and culture, were highlighted as important forces in shaping local perceptions, and by extension, responses to climate variability and change. Building on these findings, and retaining the local-scale focus, this chapter undertakes an analysis of divergent experiences and responses to climate variability and change amongst case study households and neighbourhoods, with an emphasis on social vulnerability and barriers and facilitators to adaptive capacity.

As exemplified in Chapter 2, while various approaches have been developed for analysing both social and biophysical vulnerability in the context of GEC/CC, the starting-point/systems-based approach (associated with 'second-generation' adaptation research) guides my analysis (O'Brien et al, 2004). My focus is on human dimensions of vulnerability, thus necessitating a consideration of socio-cultural, political and economic indicators. This said, guided by PE insights, I emphasise the interconnectedness between social and biophysical dimensions of vulnerability. To clarify, in Chapter 4, I explained that my intention is not to develop aggregated indexes of vulnerability that can be statistically ranked and weighted. Rather, in agreement with Patt et al's (2011) argument, I have found it more useful, to analyse and present separate causes and drivers of vulnerability (while emphasising their interconnections). Causes and categories of vulnerability were identified by research participants and through my concurrent examination of various data sources including interview and survey material and secondary sources such as newspaper articles.

Drawing on Murray (2002), Chapter 2 outlined the importance of studying the livelihoods of poor and marginalised people in relation to the livelihoods of more affluent people to facilitate a relational understanding of the drivers of vulnerability. Certainly, my core justification for incorporating socio-economically and geographically diverse populations is to reflect the realities of people living in very different, yet closely interconnected, municipal spaces and cultural contexts and consider the implications of such diversity for GEC adaptation. Furthermore, guided by

the systems-based/starting-point approach to adaptation, vulnerability analysis is focused on investigating how households have responded to climate variability in the recent past as an important proxy of likely future GEC/CC adaptation possibilities and constraints. Writing from a PE perspective, Hilhorst and Bankoff (2004:3) explain that, "Understanding vulnerability requires taking into account people's experiences and perceptions". With this in mind, I questioned households about their perceptions of vulnerability in the context of GEC/CC, as well as experiences of extreme events. Impacts and responses to extreme events[77] are analysed in conjunction with the framing past and present situational context and key livelihood constraints and facilitators as outlined by participant households. Lastly, it is important to recall that historical factors continue to shape the present in both overt and covert ways in different localities (Hillhorst and Bankoff, 2004). Thus, the vulnerability analyses that follow incorporate an historical perspective as a lens into the underlying causes and contexts of vulnerability.

8.2. Analysing experiences of extreme events as a lens for understanding current and future vulnerabilities

My study sites have long experienced extreme climatic events, such as severe storms and rainfall, which are predicted to intensify and increase in frequency as a result of anthropogenic GEC/CC (CSIR, 2006). Most participant households (80%), irrespective of socio-economic status and other key variables such as location, have been adversely affected by extreme weather (predominantly extreme storms and resultant flooding), to varying degrees in recent years. 8% of survey respondents observed changes in rainfall patterns, noting drier conditions/less rainfall than in previous years. This notwithstanding, and despite 2010 being one of the driest years on record for parts of northern KZN, with much of the rest of the province experiencing unusually low rainfall in recent years (Savides, 2010), drought did not feature as a prominent issue for most households.[78] Rather, extreme storms, intense rainfall and storm surge were the

[77] While the notion of extreme events explicates their uncommon nature CC projections reveal that they will intensify in frequency and severity, thus providing a suitable proxy for understanding likely GEC/CC vulnerabilities.

[78] This notwithstanding, water scarcity in SA is a major concern under CC scenarios (Walker and Schulze, 2008). Further, issues such as water restriction and crop failure are predominant news features. Hence, although concerns about drought did not feature prominently within the specific research sites it is likely to be a concern in other areas.

three most cited extremes. Arguably, this is partly attributable to the slow-onset nature of drought in comparison to the sudden onset and short duration of the extremes mentioned, which also pose a more immediately apparent livelihood threat. Additionally, as recent experiences, these events were at the forefront of respondent's minds, thereby influencing their responses.

Table 9 represents the divergent experiences and response capacities to extreme events between the middle- and higher-income study social groups and their low-income urban and rural counterparts (Figures 3 and 4 provide a visual representation of the study sites). These disparities illuminate important aspects about differential vulnerability among households within close geographical spaces. The following discussion presents a comparative analysis of the data summarised in Table 9. Here, I identify principal points regarding impacts and responses to climate variability, which are then analysed in greater detail, in relation to key vulnerability indicators and facilitators of adaptive capacity.

Table 9: Respondents' experiences of extreme events in the case study sites: impacts and responses[79]

Municipal regions	Broad study site and locational characteristics	3 most frequent impacts (from 30 surveys in each site)	3 most frequent responses (from 30 surveys in each site)
eThekwini Outer West	Hillcrest - varied landscape	13 property damage 12 not affected 2 nothing substantial	12 insurance claim 3 no significant response required 2 self help/DIY
	Molweni -varied landscape	12 house destroyed 9 property damage 5 deaths in the area	14 government support for food and supplies 7 support from neighbours and community 6 government funded -house rebuilt
	Ngcolosi - varied landscape, near dam	11 property damage 8 house destroyed 5 damage to household possessions	6 used pension money/savings to repair damage 5 government support for food and supplies 5 support from neighbours and community
eThekwini Southern Spatial Region	Amanzimtoti - varied landscape	16 property damage 6 not affected 4 nothing substantial	10 insurance claim 6 no significant response required 4 self help/DIY
	Isipingo -estuary properties-susceptible to flooding	16 property damage 5 not affected 4 damage to household possessions	10 defenceless 6 insurance 4 no significant response required
	Kwamakhutha -varied landscape	17 property damage 8 house destroyed 4 household and entire area devastated	22 government support for food and supplies 7 government funded – house rebuilt 7 neighbours and community helped each other
Ugu/Umdoni Municipality	Pennington/Park Rynie - extensive flat land, susceptible to flooding	15 not affected 12 property damage 5 damage to household possessions	10 insurance claim 3 no significant response necessary 2 self help/DIY repairs
	Ghandinagar - floodplain	25 property damage 17 damage to household infrastructure 4 household and entire area devastated	9 defenceless 7 neighbours and community helped each other 7 built trenches and other structures to help drainage
	Riverside Park - floodplain	23 property damage 16 damage to household possessions 2 not affected	20 defenceless 6 neighbours and community helped each other 3 temporary evacuation
	Thokoza -floodplain	20 house destroyed 8 property damage 2 household possessions destroyed	30 government support for food and supplies 8 relocated to Thokoza-government funded 8 neighbours helped each other

[79] Refer to Table 5 in Chapter 3 for a detailed classification and description of study sites, including socio-economic characteristics. The shading in Table 9 signifies the three municipal regions within which the local study sites are grouped. Figures 3 and 4 also provide a useful visual representation of the study sites.

8.2.1 Experiences of extreme events in eThekwini Outer West

As outlined in Chapter 7, on 14 November 2008, Hillcrest, Molweni and Ngcolosi study sites were impacted by a severe storm, with high winds and heavy rainfall. Several additional heavy rainfall and storm events have affected the area in the past five years (e.g. 11/10; 1/11; 10/2011 and 27/11/11 on the eve of COP 17). In brief, Hillcrest is a well-serviced middle- to upper-income suburb, whereas nearby Molweni is a peri-urban township with limited and unreliable access to basic services. Ngcolosi is a rural settlement with very limited basic services. According to many households and based on personal observation, inadequate and poorly maintained drainage and storm water infrastructure exacerbated flooding in Molweni and Ngcolosi. While drainage infrastructure was far superior and better maintained in Hillcrest than these nearby areas, 50% of Hillcrest households also highlighted inadequate capacity of storm water drainage as a major flooding concern.

In Hillcrest, 13/30 households reported 'property damage' from extreme events. As the second highest response, 12/30 households reported that they had not been affected by extreme events in recent years. In stark contrast, 12/30 Molweni households claimed that their houses had been *destroyed* by the 2008 extreme event, with 9 households reporting property damage and 5 referring to *deaths* in the area. Reiterating these claims, formal news coverage reported nine deaths, destruction of numerous homes and widespread physical injury amongst Molweni residents (eThekwini Municipality, 2008). 8 Ngcolosi households (near Molweni) also reported that their house had been *destroyed* and another 11/30 cited significant property damage.

Regarding response mechanisms, 12/18 affected Hillcrest households claimed from insurance, while 3 households reported 'no response required' (thus implying minor damage), and 2 'self help/DIY'. In contrast, no Molweni households had household insurance. Thus 14 households relied on 'government support for food and supplies', 6 had their houses rebuilt by the government and 4 reported 'self help'. Similarly, in Ngcolosi, no households had formal domestic insurance to facilitate responses, with 6 households exhausting savings or pension funds to repair the damage, 5 receiving government support and 4 DIY/self help. In addition to government support, 7 Molweni and 5 Ngcolosi households cited informal support between community members as an important form of complementary assistance for immediate responses to extreme

events. No Hillcrest households referred to informal neighbourhood collaborations or support for responding to extreme events or addressing other environmental and development problems in the area. Similar patterns of damage and response emerged within the eThekwini Southern Spatial region and Ugu/ULM, which are outlined below.

8.2.2 Experiences of extreme events in the eThekwini Southern Spatial Region

On the 29th November 2008, three weeks after the devastating Molweni 'tornado', the greater Amanzimtoti/Kwamakhutha area was struck by a short-lived and intense 'killer storm' (Magwaza and Mfusi, 2008). Many houses were destroyed, private and public property was extensively damaged and an estimated seven people were killed in Kwamakhutha (KwaNaloga Roundtable Discussion, 30/10/09). Six months prior to this, on the 17th and 18th June 2008, extreme weather conditions and associated intense rainfall ravaged the south coast region of KZN with concentrated high rainfall of 195.2 mm and 92.2mm respectively (SSI Bohlweki, 2009)[80]. Consequently, the KZN south coast was declared a disaster area due to extensive private and public property and infrastructure damage caused by mudslides, erosion and flooding (*ibid*). Kwamakhutha, Isipingo and Amanzimtoti were variously affected by these events. Although located in close proximity, these areas are starkly contrasted in terms of socio-economic and demographic make-up, as well as critical public infrastructure provision and maintenance. To recap, Kwamakhutha is a peri-urban region, with predominantly low-income households. Isipingo is a suburban area and socio-economically diverse area. While greater Isipingo includes affluent households, 20/30 participant households classified themselves as low- and the other 10 as middle-income. Amanzimtoti is a suburban middle- to high-income area.

My empirical results show that households in the Kwamakhutha area suffered disproportionate losses and adverse impacts in comparison to those in Amanzimtoti and Isipingo. 17/30 Kwamakhutha households reported extensive property damage, 8 households claimed housing *destruction* and 4 explained that in addition to their housing structure, the entire area suffered much destruction. 8 Kwamakhutha households also referred to deaths of community members as a result of the storm. Only 2 Kwamakhutha households stated that they had not been adversely affected by extreme events. In response, 22 of the 28 affected households relied on government support in

[80] This is considered extreme since annual average rainfall is 500mm (Viljoen and Booysen, 2006).

the form of food vouchers and other supplies such as blankets, while 7 households explained that the government built their new RDP house[81] as a result of their previous house being destroyed. In addition to government support, 7 households observed the importance of informal social support and networks between local households for dealing with flooding and other extreme events. Drainage infrastructure was very poor and badly maintained in Kwamakhutha, with high surface runoff and high levels of blockage by uncollected garbage. Several Kwamakhutha and, to a lesser degree, Isipingo, households, reported feelings of extreme fear and stress every time it rains or when storm clouds are looming.

Regarding impacts of extreme events in the past five years, 16/30 Amanzimtoti survey respondents reported property damage, 6 reported no damage, 4 'nothing significant' while 6 households claimed that they had not been affected. Generally, property damage was evidently less extensive than in Kwamakhutha due to superior quality and location of housing and storm water drainage. As the most popular response, 10/17 affected households claimed from insurance to repair damage, while 4 households adopted 'self-help/DIY practices', such as replacing roof tiles and fixing gutters. Further, 3 households explained that 'no significant response' was necessary. In addition to storm events, households surrounding the Isipingo estuary (see Plate E) have also experienced significant flooding damage due to a storm surge event on the 18th March 2007, resulting in approximately R2 billion worth of damage to KZN's coastline (SSI Bohlweki, 2009). 16 Isipingo survey respondents explained that flooding from the storm surge and high rainfall events, particularly over the past five years had caused damage to the exterior of their housing structure (e.g. drain pipes broken, damage to roofing). 4 households also claimed that their possessions, such as furniture and carpets, had been significantly damaged. Only 5 households had been unaffected by extreme events. 6 responded through making insurance claims and 10 households explained that they are 'defenceless' against extreme events. A main justification for this perception of defencelessness was being uninsured against damage from climate stresses due to financial constraints and powerlessness in the face of extreme events bought on by nature or God.

[81] RDP housing is mass built, cheap and government-subsidised houses introduced under the ANC's RDP (see Chapter 3) to meet constitutional rights to housing.

Amanzimtoti and Isipingo neighbourhoods had superior quality and maintenance of drainage infrastructure compared with Kwamakhutha. However, certain recent developments (e.g. Arbour Town out-of-town shopping centre) had compromised and exceeded drainage capacity in both Isipingo and Amanzimtoti, thereby leading to increased runoff and flooding. This was exemplified in the June 2008 storm, when Amanzimtoti households living adjacent to Arbour Town experienced severe property damage as result of inadequate storm water drainage and consequent landslides and flooding (this issue is revisited in Section 8.10). Inadequate and poorly maintained drainage infrastructure was also noted as a major household concern across these three sites.

8.2.3. Experiences of extreme flooding events in four ULM/Ugu study sites

Umzinto, within ULM, was one of the worst affected regions during the June 2008 storm event. The area recorded its worst flood since 1959, leaving over 800 people homeless and with an estimated 8 deaths reported (B1; B3; SSI Bohlweki, 2009). Ghandinagar Township and RSP study sites were particularly hard hit, as well as Sinathan Informal Settlement.[82] Coastal Park Rynie/Pennington neighbourhoods, approximately 12km South of Umzinto, suffered considerable damage to municipal infrastructure and some private property damage during this and other recent rainfall events. Ghandinagar, RSP and Thokoza are low-income settlements with weak public infrastructure. These settlements are all located within Umzinto, labelled "the runt of the Umdoni municipal family" in a local newspaper (Thompson, 12/01/2010). This is due to the deteriorating state of the area. Pennington/Park Rynie is a middle-income area with superior public infrastructure than its Umzinto counterparts, but also poorly maintained and under-capacitated.

25 Ghandinagar households reported severe property damage and 17 explained that their household possessions had been destroyed. Similarly, 23 RSP residents had suffered extensive damage to housing structure and 16 households' possessions, mostly furniture, tiling and carpeting due to flooding, had been damaged or destroyed. Significantly, 20 Thokoza households reported that their informal dwellings in the nearby Sinathan informal settlement had been *washed away/destroyed*, destroying most

[82] Together with people from nearby affected rural areas, homeless Sinathan residents were relocated to Thokoza transient settlement, thereby justifying the selection of Thokoza as a study site.

of their possessions. 8 households explained that they were relocated to Thokoza because their houses had been severely damaged and were still battling to recover their destroyed household goods and other losses. *Every* Thokoza respondent noted government support for relocation or food and other essential supplies when explaining their response to extreme events and 4 respondents mentioned support from local NGOs.

Twenty RSP and nine Ghandinagar residents explained that they were 'defenceless' in the face of extreme events such as flooding and thus felt unable to respond. This defencelessness was mainly attributed to perceived powerlessness against flooding and other extreme events 'sent by God' or that God controls (see Chapter 7). Some houses also noted the inescapable dangers of living on a floodplain, inadequate drainage and infrastructure, as well as no insurance and inefficient funds to recover. Households cited reluctance on the part of insurers to insure properties within the floodplain and unaffordability as main reasons for not having household insurance. Indeed, only one Ghandinagar household and no RSP households mentioned insurance as a response mechanism. In anticipation of further floods several households in these areas have built trenches, raised foundations and increased vegetation cover to protect their properties. While these actions can be classified as adaptation measures, they raise important questions about the long-term appropriateness, feasibility and sustainability of adaptation on a floodplain. This issue is returned to in Section 8.10.

7 Ghandinagar and 6 RSP households (including some who had cited defencelessness) emphasised the critical role of informal support among neighbours and the wider community for assistance during extreme events. 8 Thokoza residents also referred to the importance of such support. However, 6/8 households explained that this form of support was not yet well established within the settlement. In addition to informal community support, Ghandinagar FVC and RSP Ratepayer's association also served as important community bodies for approaching local government over environmental and flooding concerns. Ghandinagar, RSP and Thokoza households reported high levels of stress due to flooding experiences, with several respondents expressing that they "live in fear" and were "fearful every time it rains/when dark clouds come". Drainage infrastructure was in a poor state of repair and capacity was insufficient in Ghandinagar

and RSP. Litter and other effluent also blocked many drains in the area. Due to its 'temporary' nature,[83] Thokoza housing has no storm water drainage.

In stark comparison to these nearby ULM sites, only 50% of Pennington residents had been affected by extreme events. Property damage (12/30) and damage to household possessions such as furniture (5/30) were the two most cited effects. However, according to household accounts, this damage was much less severe than in the other municipal study sites. 10 of the 15 affected households claimed from insurance as their key response, while 3 explained that no significant response was necessary and 2 practiced DIY repairs. Drainage infrastructure was in a slightly better state in Pennington, yet as in the other three sites, almost *every* household (27/30) stated inadequate drainage and storm water infrastructure as a pressing local concern.[84]

8.3. Understanding key responses as (mal) adaptation or coping

The above synopsis has illuminated differential vulnerabilities between households within and between different municipal spaces. While there was intra-neighbourhood or community variation in impacts and responses, variation was most distinct between low- to middle- and high-income neighbourhoods. Before analysing these aspects in greater detail, it is important to note a few key points regarding predominant household responses to extreme events represented in Table 9.

Essentially, adaptation requires long-term, ongoing and anticipatory adjustments to livelihoods, housing sites, development patterns and so forth in order to reduce vulnerability to repeated hazards such as flooding. As a prevalent response, government funded (and private) rebuilding of stronger houses and relocation can technically be classified as adaptive strategies. However, due to several complexities addressed below, these actions have, in some instances inadvertently led to maladaptation. Moreover, Section 8.2.3 raised the question of the appropriateness of 'adapting' household infrastructure on a floodplain as Ghandinagar households have done in response to flooding risks. Over and above these reactive (mal)adaptive strategies, most responses, as stated by households across the socio-economic spectrum, can be classified as short-

[83] Established in 2008 and existing till present, the 'temporary' settlement appears to have become semi-permanent in nature. This issue is addressed further in Section 8.10.
[84] The implications of and potential for these common concerns and problems across study sites in terms of driving change within government agendas is addressed in Section 8.4.5.

term coping strategies. This classification is based on the observation that principal focus was on returning to 'normality' through insurance claims or once-off government support and did not attempt to shift the status quo or necessarily account for and adjust to different circumstances with a long-term outlook (Munasinghe and Swart, 2005). Moreover, in addition to the prevalence of coping strategies, Chapter 7 explained that very few respondents differentiated between mitigation and adaptation and the majority of suggested CC actions (see Table 8) were mitigation orientated. These findings reiterate that adaptation measures are still in their infancy within most study sites.

The comparative analyses presented above pinpoint several core issues relating to experiences of extreme events, which require further consideration. From a PE vulnerability perspective, it is important to understand these issues in relation to the range of vulnerability drivers to GEC/CC impacts identified by survey participants categorised in Table 9. Markedly, most of these are not direct climatic or physical forces (e.g. sea level rise or storm surge), but existing livelihood stresses (e.g. poor housing conditions, poverty and location), shaped by the broader workings of the inequitable political-economic order. While it is difficult to separate out vulnerability drivers because these operate in concert, many households clearly view non-climatic forces as overarching vulnerability drivers. Couched within a consideration of situational contexts, additional co-emergent GEC/CC factors and the vulnerability drivers listed in Table 9, the following analysis considers the above experiences of extreme events in greater detail. While not representative of entire neighbourhoods, the results underscore important aspects that require further attention in the development of adaptation measures. Drawing from the livelihoods framework outlined in Chapter 2, data are presented according to key livelihood factors such as access to socio-economic resources and natural resources. Chapter 7 exemplified the pivotal role of cultural and religious beliefs in shaping vulnerabilities, thus these are not discussed in depth in this chapter.

Table 10: Household perceptions of key factors that influence vulnerability to climate change in descending order

Response	Frequency (out of 300)[85]
Location (e.g. near dam, floodplain)	74
Poor housing condition and materials	46
Lack of education and understanding	33
Not sure	33
Frequent storm damage	25
Poverty and lack of resources	23
Inadequate infrastructure and maintenance	18
Disrespecting and disobeying God	18
Inadequate government support	14
The nkanyamba/snake	12
Health impacts	11
Lack of preparedness	11
Lack of social networks	11
Climate change sceptics/non-believers	9
Age	6
Inadequate access to basic services	4
Inadequate emergency response capacity	3
Nothing	2
Inability to grow own food	1

8.4.1. Socio-economic status as a key vulnerability indicator

As anticipated, socio-economic status emerged as an overarching vulnerability driver and determinant of adaptive capacity. Financial resources in the form of cash flow and other means are vital for people to sustain their livelihoods, recover from livelihood shocks and to support GEC adaptation measures (Reid and Vogel, 2006; Satterthwaite, 2011). Unemployment levels were particularly high in the low-income settlements, with monthly incomes being very low and inconsistent. Financial resources were derived principally from informal employment (often in the form of 'tuck-shops' on household premises selling sweets, snacks and sometimes alcohol and cigarettes), 'piece' (temporary) work, as well as government social grants and remittances. Unemployment, poverty and lack of resources were identified as fundamental livelihood challenges and outlined as principal drivers of vulnerability in low-income areas (see Table 10). While unemployment was a major factor in low- and some middle-income urban households, employment opportunities appeared to be even more restricted in rural areas, particularly in terms of feasible daily commuting distances.

[85] Total responses exceed 300 since several households gave more than one response.

Conversely, most households in the middle- to upper-income sites had one or more members in full-time employment. The surveys did not elicit precise data on household budgets (income from various sources minus expenditure) since, as exemplified, income group allocation was based on self-ascription, due to pervasive tendencies towards reluctance to reveal socio-economic status (social desirability responding)[86] and because precise incomes are not significant to this study. This notwithstanding, it was clear that middle- to high-income households' financial capacity greatly enhanced their ability to ameliorate the impacts of climatic stresses than was the case for their low-income counterparts. This disproportionate capacity was shaped by ability to afford household insurance cover (often including household contents cover), investing in strong and well-maintained housing structures and as a result of affording to live in well-serviced and less risk-prone areas.

Economic status also indirectly influences livelihood vulnerability to GEC through determining access to other household resources such as health care, education, transport and ability to afford basic services such as water and electricity (Satterthwaite et al, 2009). Household income and employment levels were highly racialised, with white households in Amanzimtoti and Hillcrest generally being the most financially well off. Indeed, while there has been an expansion in the African middle class since 1994, poverty can still be defined largely along racial lines in SA (May, 2001; Terrablanche, 2002; Marais, 2011).[87] In SA, poverty has historically been more severe in rural areas, but, is now increasingly concentrated in urban areas (SACN, 2011). In some instances, low education levels in low-income households can also be linked to occupations and consequent poor financial status (Adelekan, 2010). The uneven spatial and social distribution of poverty needs to be a central concern for GEC adaptation in order to ensure that existing disparities and vulnerabilities are not further entrenched. These disparities exist in very close proximity since as is well documented; wealth and poverty exist 'cheek by jowl' in the SA context (Nel et al, 2003).

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[86] Socially desirable responding is "the phenomenon of respondents seeking to present themselves in a favourable manner" (Thompson and Phua 2005: 541) and is common to self-administered research. People sometimes deflate their income when it is high or inflate when it is low. Social desirability responding is applicable to other socially sensitive issues such as religion (Narayan and Petesch, 2007).

[87] Marais' (2011) publication affirms concerns and doubt raised by the two authors in the earlier publications regarding the transformative potential of post-apartheid policies and reconstruction programme.

8.4.2. Formal and 'informal' insurance as core vulnerability factors

Access to formal household insurance cover (linked to access to financial capital) emerged as a principal indicator of differential vulnerability to damage from extreme events. Evidently, affluent households were more able to afford insurance than low-income households, and no rural households had formal household insurance. This notwithstanding, in the rural (Ngcolosi and Sezela Rural), as well as peri-urban sites (Kwamakhutha and Molweni) '*stokvels*'[88] emerged from my empirical data as a vital source of informal insurance and social capital, albeit not directly drawn on for coping with damage from climatic stresses and not directly comparable to the role of formal household insurance for flood protection damage. '*Stokvels*' are informal collective saving or rotating credit schemes or clubs and have existed for decades in African rural and urban communities. In SA, these schemes are a popular way of saving for the poor, who often lack access to formal financial services. Moreover, recent studies have shown that *stokvels* are also an emerging trend for upper-income urban households in SA (WBS, 2009). The percentages of households belonging to *stokvels* at the time of my survey were as follows: Molweni: 50%, Kwamakhutha: 40%, Ngcolosi: 57% and Sezela informal interviewees: 3/6 (50%).

There are various forms of *stokvels* such as funeral insurance, savings for groceries and other assets, as well as social activities. Food or grocery *stokvels* were most prevalent among participant households, with a few also belonging to savings and funeral cover *stokvels*. These schemes play a significant role in the SA economy, with an estimated R12 billion invested per annum and one in every two black adults belonging to *stokvels* (WBS, 2009). Despite increasing private sector interest, *stokvels* remain predominantly informal. Importantly, similar self-help saving schemes[89] exist within different SA regions and cultures (*chita* among Hindi-speaking Indians in KZN) (I11, Ghandinagar) and indeed worldwide, under various names (e.g. *hui* in Japan and *Tontine* in Cameroon) (Bouman, 1995). For instance, Bouman (1995) reports 50-95% membership

[88] *Stokvels* can be defined as "a type of credit union, or communal buying group, in which a group of people enter into an agreement to contribute a fixed amount of money to a common pool weekly, fortnightly or monthly, to be drawn in rotation according to the rules of the particular *stokvel*" (Lukhele, 1990, in WBS, 2009: 1). The term stems from the Afrikaans term 'stock fairs' or rotating cattle actions used by 19th century British settlers in SA.

[89] Self-help schemes, specifically financial focused schemes are classified under the umbrella generic term Rotating and Accumulating Savings and Credit Associations (ROSCA).

to self-help savings and credit groups in other African regions such as rural Cameroon and Nigeria.

No households referred to *stokvels* as a support mechanism for direct responses to flooding or storm damage. Despite this, the well-established institution shows potential for diversification to include climate stress-specific financial and social support. Indeed, with reference to 'mutual aid' groups across Africa, Bouman (1995: 372) confirms, "The innovations and adaptations one finds in these organisations are testimony to the variety of needs people have and the way they innovate to satisfy those needs". Arguably, although the explicit connection was not made, various *stokvel* types can be interpreted as an existing anticipatory adaptation, serving as informal insurance (thereby compensating for lack of formal insurance in some cases) and support for food insecurity, which is likely to intensify as result of a CC-induced decline in agricultural productivity. *Stokvels* also provide social benefits because membership often entails group meetings and networking, thereby creating opportunities for information and experience sharing (Bouman, 1995). In sum, I argue that as a widespread and well-established form of social and financial capital, *stokvels* can potentially enhance adaptive capacity and should receive more attention in the context of GEC/CC pressures. This argument applies to low- as well as middle- to high-income households and all race groups, especially since formal insurance costs are likely to escalate as CC impacts intensify.[90]

8.4.3. Access to secure housing, vital infrastructure and basic services

Despite adequate shelter being a constitutional right, SA is still plagued by major housing backlogs, with an estimated 2.4 million households living in informal and substandard/inadequate housing (Lemanski, 2009). As in most contexts, there were large variations within and between study sites in terms of housing quality, as well as the extent of basic infrastructure and service provision. While geographical location (e.g. floodplain) played a central role in determining impacts, quality of housing was

[90] While not exempt from complexities (e.g. community politics, non-payment), the community-driven nature of *stokvels* means that they do not have the same risks as formal insurance where premiums are likely to escalate as CC impacts intensify and insurers may become unwilling to insure against certain impacts.

also clearly a principal factor for shaping disparate vulnerabilities to extreme events. Houses that were destroyed were disproportionately built of weak construction materials, variously including clay, mud, corrugated iron, wooden planks and plasterboard. Clearly, household destruction directly affects livelihoods through compromising wellbeing and ability to meet basic needs. Housing condition is directly related to household asset bases for affording quality living materials. Hence, the most vulnerable households in terms of asset bases were also often the most susceptible to household destruction. Plates A and B illustrate typical weak materials used by vulnerable households in various study sites. Plate C represents typical sub-standard housing in Molweni, where several houses were 'destroyed' in the 2008 storm event. Plate D shows a (rebuilt) Ngcolosi household that was destroyed in the 2008 storm event, which is clearly still built from weak materials and is highly vulnerable to climatic stresses.

Plate A: Kwamakhutha – metal roof sheeting 'secured by tyres, stone and wood

Plate B: Sezela Rural – plywood walling, plastic sheet roofing

Plate C: Typical Molweni houses

Plate D: Ngcolosi house

Households that reported 'no' or 'some' housing structure damage as opposed to total destruction were less vulnerable as their housing infrastructure consisted of stronger materials; mostly bricks, concrete and tiled roofs (see Plate E). Housing quality also had a clear impact on vulnerability to increased temperatures since many households with poor ventilation and inadequate insulation complained of heat stress and battling to cope with the heat. Housing condition (physical capital) is closely linked to financial resources, which are pivotal to purchasing and maintaining housing infrastructure.

Plate E: Isipingo estuary houses - although impacted by flooding, these houses were not destroyed, partly due to strong foundations, drainage and materials used

Vulnerability to flooding and other extreme events has been exacerbated by inadequate provision of basic services, failure to expand and maintain storm water drainage and existing drainage systems, as well as inappropriate developments where the inseparability of SES is inadequately accounted for. Basic infrastructure (adequate drainage, secure housing locations, sanitation and piped water) and services (disaster/emergency services, education, health care, waste collection, energy supply) support resilience to climate variability and change impacts. Thus, large deficits prevalent in the SA context and in most developing contexts significantly undermine adaptive capacity (Satterthwaite et al, 2009).

Public or government-provided physical capital including basic services and infrastructure differed considerably between research sites and disparities were most pronounced between low and high-income settlements and rural and urban areas. These divergences noted, vulnerability of both urban and rural populations is rooted largely in poor urban governance and inadequate planning. Differing vulnerability or resilience levels of local populations are directly connected to the quality of local governance

since, according to Satterthwaite (2011: 768), "what dramatically reduces the differentials in environmental risks between low-income groups and wealthier groups is universal provision for basic infrastructure" and services. As a major theme, these arguments are developed further in the final part of this chapter, which considers the relation between policies and actions of local government institutions and local level vulnerabilities.

As noted above, in addition to exposure to climatic extremes, several other factors emerged from my empirical data sources as key indicators of vulnerability or resilience to climate variability and change. Household engagement in subsistence agriculture emerged as a significant indicator of vulnerability and is now considered before analysis shifts to additional prominent social indicators of vulnerability.

8.4.4. The role of subsistence agriculture for supporting rural and urban households in the context of GEC/CC

Subsistence agriculture played an important role for food security in many low-income rural and urban households in both municipal regions. Varying levels of dependency were evident, yet no household, including in rural areas, was entirely dependent on subsistence agriculture for sustaining their livelihoods, because market-bought goods were purchased as substitutes. Subsistence agriculture was most prevalent in Ngcolosi (80%) and Kwamakhutha (77%) households, followed by Molweni (47%) and Ghandinagar (38%).[91] Main produce included maize, pumpkin, corn, spinach, mangoes, bananas and sweet potatoes. Many of these, specifically maize (a staple crop), are predicted to decline in productivity under predicted CC scenarios (Ford, 2009). While I did not probe specific percentages of subsistence agricultural dependence, most households from these sites substituted their food sources only sometimes or occasionally during harvesting times, yet, during these times reduced spending on market-based goods was a significant noted benefit. Commercial agriculture was very rare, with only two households in Ghandinagar, two in Ngcolosi and one in Molweni noting that they sold their crops to their broader community. Interestingly, regarding the middle- to high-income neighbourhoods, only 3 households in Amanzimtoti, 3 in Hillcrest and one in Pennington grew fruit and vegetables on a small scale, motivated by

[91] Several RSP and Thokoza households expressed the need and desire for subsistence agriculture but were restricted by lack of private gardens and green open-space.

‘interest in gardening’ and ‘as a hobby’. Produce mainly included herbs, spinach, tomatoes and carrots. These seven households noted the effect of increased temperatures and dryness on their produce but were able to respond through affordable access to hosepipe watering.

Many low-income households, especially those that relied on dryland farming, observed that increased heat and lack of rain had recently impacted agricultural productivity adversely: “my crops died because of the dryness, I can’t water the crops and now I have more poverty” (S6, Ngcolosi), “I can't grow *mielies*[92], everyone have to try and buy everything, can't get food from garden because of dryness” (S27, Molweni). Some claimed that they had already stopped planting certain crops and vegetables such as maize due to unreliability of rainfall. The fact that that these households’ agricultural activities have already been affected by climate variability indicates that they are vulnerable to food insecurity as agricultural activities become increasingly sensitive to predicted GEC/CC impacts. Despite these observations, there was very limited indication of adaptation in the form of diversification from traditional crops and vegetables to drought- and heat-resistant varieties such as cassava or sorghum.

Limited crop diversity and productivity is likely to have detrimental effects on overall livelihoods, especially in the longer-term. The dearth of subsistence agriculture among more affluent households (many of which had large gardens) indicates that, in the long-term, these households may become more vulnerable to food insecurity as market-based food prices rocket due to a widespread reduction in agricultural productivity. These results reiterate the importance of extending existing government initiatives such as the ‘one home, one garden’ campaign which encourages urban and rural households to create food gardens to facilitate food security (DEARD, 2011) and eThekwini’s community adaptation pilot project which engages local community members from various pilot sites in testing the acceptability of alternative staple crops from a social perspective (Ford, 2009). Furthermore, these food security issues are a clear reminder of the temporally variable nature of household vulnerability and municipality wide vunerability maps or patterns.

[92] *Mielie* is an Afrikaans term for maize or corn, a staple crop in South Africa.

The discussion now turns to a consideration of pivotol social indicators that emerged within the study sites.

8.4.5 The role of social networks and social resources in influencing vulnerability and adaptation possibilities

Strong social assets and political capital are widely noted as potential drivers of GEC/CC adaptation and vulnerability reduction, especially in the context of limited financial and physical capital (Adger, 2003; Pelling, 2003; Pelling and High; 2005). Social assets or capital are variously defined but generally include access to networks, community cohesion, membership to formal and informal organisations and reciprocal relationships based on trust (Pronyk et al, 2008). Pelling (2003: 61) explains, "it is the number and character of these assets that forms the social dimension of a local area's or city's capacity to adapt to perceived environmental risk." The importance of social relations was relatively well recognised at various scales. Indeed, 10 government officials, 7 non-government interviewees, 32/300 survey respondents and an additional 9 household interviewees highlighted a lack of social cohesion and resources as key GEC/CC vulnerability drivers in both rural and urban areas. As stated, *stokvels*, as well as religious faith and cultural frameworks, constitute important (albeit complex ad contested) social resources, especially for low-income households. Advancing these analyses, the following discussion reveals the differential role of social capital for supporting responses to GEC/CC between the study sites.

While it is important not to generalise due to intra-community variations, two main trends emerged in terms of neighbourhood/community relations. On the one hand, households described their broad sense of community as weak to non-existent, citing issues such as "everyone here is for themselves" (I25) and "we don't call on our neighbours when we need help after floods. We can't, we all need to look after our own households here" (I22). Interestingly, these were typical responses in the middle- to upper-income urban areas of Amanzimtoti, Isipingo, Hillcrest and Pennington. None of these households referred to support from neighbours or local social networks for responding to extreme events, or for any other reason. Hence, in these cases, poor senses of community can be linked to the limited presence of informal social networks and support (the role of CBOs and NGOs are addressed below). Amongst others, possible underlying reasons include politics, social fragmentation and increasing

anonymity in urban areas (Pelling; 2003; Coetzee, 2002). As an eThekwini official (A4) explained, with specific reference to urban contexts,

> Yes, 'A11' hit the nail on the head about the importance of social cohesion. It is needed to compensate for other lacking issues, but the fact of the matter is that I think urban living means that you don't have that social cohesion, its that kind of dysfunctional environment, urban living does not equate to social cohesion.

Conversely, among the remaining households, sense of community was mainly described as being relatively strong: "we are close, we come together" (S2 Ghandinagar). Such viewpoints were concentrated within low-income rural and peri-urban neighbourhoods, as well as low-income Ghandinagar and RSP urban settlements. These same households often stressed the importance of informal support between community members for assistance during flooding and other extreme events (specified above). Therefore, in these instances, a strong sense of community can be linked to the presence of social networks and informal support. Certainly, not all households within these areas benefitted equally or felt that social ties were strong due to certain inevitable community tensions. As S1 from Ghandinagar explained, "the community is quite close but there are a lot of problems in terms of politics, *shebeens*[93] and drugs". However, the following quotes exemplify typical experiences in these sites: "Our neighbours are very important to us: they are the first ones to get to us, they give us support, our family lives far away"(I9). Furthermore, an Ngcolosi resident (S8) claimed, " we are close here, we help each other out like during that big storm, my neighbour helped me get my kids safely to her house where we waited".

Beyond informal mutual community support during times of severe and sudden adversity, there was little evidence of longer-term united efforts to address other neighbourhood socio-environmental problems. Hence, at present, social networks mainly support coping capacity and not necessarily sustained adaptive capacity. The strongest presence of sustained and collaborative neighbourhood action was in Ghandinagar, where 10/30 participant households were members of the Ghandinagar FVC and in RSP, where 14/30 households belonged to the RSP Ratepayer's Association. Their primary function is to serve as united bodies to engage with local government institutions over environmental and development decisions in the area. However, according to interviewee feedback, these community establishments have had

[93] *Shebeen* is a Zulu term for an informal bar or liquor store, often illegally operated from the owner's house.

limited impact on reducing vulnerability to environmental and other risks. Interviewees attributed this to alleged relative 'powerlessness' to influence municipal decision-making processes and insufficient funds to initiate projects (E2; E5). As I14 from Riverside attests,

> We have attended lots of meetings as a united front for this place about our problems and proposed solutions, but we are very angry that nothing has been done. We have made banners, we have marched, we have tried peaceful approaches, but nothing works. They say they are addressing our issues but we are yet to see anything done.

Therefore, municipal engagement with local communities and their actions is 'performative' (after Hajer and Versteeg, 2005) and tokenistic, rather than responding and addressing needs and concerns in a tangible manner.

Pennington Conservancy, run by local residents, was also well established but membership among participant households was low (4/30). In sum, despite an increasingly strong NGO and CBO presence in the broader eThekwini and Ugu districts (see Chapter 3), there was very little evidence of membership of such organisations amongst participant households, which can also be attributed to, amongst other factors, political conflicts, social fragmentation and disillusionment as described above. Chapter 5 and 6 also explained that while numerous formal and informal NGOs and CBOs arrangements are visible in the study contexts and broader SA, both government officials and members of such groups admit that their impact on government GEC/CC and other agendas has been hitherto limited. This notwithstanding, as a visiting scholar at the CCS UKZN and through attending various public workshops, I learnt there is an emerging groundswell of civil society and NGO activism and action relating to GEC/CC that may begin to impact municipal GEC/CC agendas and help to encourage a greater focus on justice and other key issues.

The widespread lack of community cohesion in certain areas and scant evidence of sustained and effective efforts to address environmental and other problems reveal a possible barrier to adaptation at these scales. Nevertheless, the existing strong sense of community and ad hoc informal support in various areas during times of stress provide a potential platform for the establishment of joint and sustained anticipatory GEC/CC adaptation initiatives. Moreover, despite diversity in terms of income and experiences of GEC/CC, the above analysis has revealed that there are certain common issues, such as service delivery and infrastructural problems, across the study sites. There is potential

for communities to unite over these common issues, which also have direct relevance for GEC adaptation in confronting government. Indeed, since SA has one of the highest per capita protest rates over service delivery (Marais, 2011), there is considerable potential for more united campaigns for GEC/CC action, especially when the links to service delivery are made. Due to their frequently intangible nature, social factors often evade policy consideration (Pelling, 2003; Pelling and High, 2005). However its pivotal role necessitates greater consideration in the context of GEC/CC pressures and inadequate government support.

8.4.6. Differential psychological impacts linked to exposure to climatic stress

Sections 8.2.1-8.2.3 revealed that psychological impacts are highly differentiated within and between neighbourhoods in different municipal spaces. Psychological and health impacts resulted from direct emotional and physical harm during extreme weather events and from indirect emotional stress due to living in perpetual fear of similar future experiences and the stresses of trying to recover losses. The consequences of these effects included anxiety, inability to sleep well, and feeling 'down', anger towards authorities for perceived neglect, despair and a sense of helplessness/defencelessness against overwhelming impacts. As a Ghandinagar resident (I9) explained,

> We live in fear, we don't sleep at night because we are so afraid at night when it rains. The changes of weather are bad; we never know what is going to happen, but you know, I am not sure that those richer folk have the same experiences as us, do they?.

Further, an Ngcolosi resident (I28) in eThekwini Outer West relayed their anguish as follows, "I am too fearful when it rains and the rivers are full, I fear my house might fall down, it is not in a strong condition". Clearly, psychological effects are amplified by chronic livelihood stresses such as unemployment, poverty and sub-standard housing. Indeed, it was often the most vulnerable households in terms of poverty and other livelihood stresses that expressed psychological effects. Until recently, psychological and emotional factors of adaptation to GEC/CC have received limited attention in comparison to technological, infrastructural and other 'hard' aspects of adaptation and DRR. Similar to many social and cultural influences, this can be attributed, in part, to their often intangible and non-quantifiable nature. Importantly, Pelling (1997) and Adelekan's (2010) empirical research in Ghana and Nigeria respectively, revealed similar results in terms of differential psychological impacts from flooding. Psychological impacts associated with climatic stress could be far

reaching and my empirical results underline the need to account for differential psychological vulnerability to climate stresses and the possible implications for adaptive capacities.

This section on psychological vulnerability concludes the analysis of prominent vulnerability drivers in relation to climate variability and change, as identified by research participants and my independent data analysis. Evidently, vulnerability drivers manifest in different ways across municipal landscapes, thereby producing complex vulnerability landscapes.

8.5. The dynamics of vulnerability to GEC/CC

Despite many households experiencing damage from and expressing concern and awareness at their likely increase, climate variability (including extreme events) and change did not feature as the most pressing concerns. Rather, unemployment, poverty/inadequate income, crime, inadequate drainage infrastructure and basic services, inefficient and incompetent/unreliable and corrupt government were the main livelihood stresses mentioned across the study sites in both municipal contexts. Hence, combined with direct physical impacts of climatic stresses, there are a number of complex and variable factors that stakeholders indirectly identified as undermining adaptive capacity. However, since GEC/CC is likely to create fundamental changes to existing SES and cycles (e.g. 1/100 year floods becoming more frequent), CC could be the crunch factor or tipping point for the other structural vulnerabilities raised as main concerns among participants. Nevertheless, this argument was not well recognised amongst participants.

Conversely, I revealed several facilitators of adaptive capacity (e.g. social networks, shared belief systems, *stokvels*) in different contexts, which need to be supported to enhance resilience and anticipatory adaptation. Indeed, livelihoods are produced within complex macro- and micro-influences, which shape specific and locally differential vulnerability contexts. “Vulnerability, then, is not a property of social groups or individuals, but is embedded in complex social relations and processes” (Hilhorst and Bankoff, 2004: 5). For example, vulnerability to flooding and other climate stresses was rooted not only in physical causes/forces (i.e. high rainfall, eroded vegetation cover and compromised wetland functions) but also in fundamental weaknesses in government

institutions (under-resourced and inadequate provision and maintenance of basic services including storm water drainage) and multiple co-variate livelihood stressors at household-scales. Therefore, essentially, biophysical vulnerability cannot be separated from social vulnerability, since environmental and social systems or SES co-construct the vulnerability of households to climate variability and extremes in a context-dependent way (Paavola, 2008). This reiterates the salience of second-generation socio-ecological or human-environment systems approaches for understanding vulnerability and adaptive capacity (See Chapter 2). In short, it is crucial that local developmental or situational contexts are accounted for in conjunction with finer-scale livelihood 'stress bundles' (after Fragkias, 2007) to strengthen adaptive capacity and develop appropriate adaptation measures to climatic stresses in different municipal spaces.

Viewed through a PE lens, above analyses have revealed that pre-existing socio-cultural, political and economic factors combine in different ways to create differential patterns of vulnerability across municipal landscapes. Further, this Chapter further illustrates the importance of poststructural PE emphasis on being open to multiple ways of knowing related to peoples social standing, political stance and other factors rather than narrow outlooks. Building on this, the following section underscores the importance of understanding vulnerability (and resilience) and livelihood production through an explicitly spatial lens.

8.6. The importance of 'spatialising' livelihoods and vulnerability to GEC/CC

The importance of understanding livelihoods through a political ecological lens and the centrality of 'spatialising' livelihoods were emphasised in Chapter 2. As a consequence of subjection to centuries of social and spatial regulation, vulnerability distortions assume profoundly spatial dimensions in the study contexts. SA's space-economy is characterised by stark contrasts and inequalities rooted in SA's discriminatory past and current inequitable political-economic order and development context (see Chapter 3). Geographical location plays a key role in shaping vulnerability to GEC/CC impacts, specifically extreme events such as floods. Environmentally racist planning practices commencing in the late 1930s and culminating in the apartheid era created racially segregated settlement patterns where 'non-white' communities were often consigned to marginal land such as underserviced urban peripheries and rural areas, often on floodplains or steep slopes. Often these living environments are also highly degraded.

An added socio-economic dimension now characterises these persistent racial geographies, with poor and under-resourced households tending to occupy marginal and risk-prone land. While the democratic transition is slowly reshaping aspects of these vastly unequal risk landscapes or spaces of risk, GEC/CC impacts remain disproportionately loaded onto marginalised groups within the society. There is a stark contrast in wealth, development needs and opportunities that exist within different municipal spaces, particularly between coastal and inland rural areas due to inequitable resource allocation between these areas (Houghton, 2005). Unequal power relations and political influences further exacerbate this situation.

Linked to this juxtaposition and further complicating spatial manifestations of vulnerability, Cartwright (2008) points out an atypical trend in SA where vulnerability to the physical impacts of sea-level rise is not loaded on the poor because the apartheid space economy resulted in coastal properties being disproportionately owned by affluent (mostly white) people, as well as local governments. In contrast to many poor households occupying risky locations, these households predominantly *choose* to occupy these coastal properties (as exemplified by McCarthy, 1986; Bartlett et al, 2009). For example, certain households in my Isipingo (estuary mouth area) and Amanzimtoti (coastal areas and slopes) study sites had chosen to live in vulnerable coastal locations for various reasons such as lifestyle and aesthetics. These more affluent households often have the financial capacity to reinforce housing infrastructure and invest in household insurance. Nevertheless, in the long-term, these coastal properties, tourism and municipal infrastructure are at great risk from sea level rise and storm surge, as the 2007 storm surge event showed.

Therefore, the complex spatial distribution of people and physical assets immensely complicates the development of adaptation measures in the context of temporally and spatially variable vulnerabilities. Evidently, several complementary adaptation measures are needed, which account for the disparities between different municipal spaces but at the same time centrally account for their interconnectedness to avoid cross-scalar maladaptation. Importantly, since there are a multitude of GEC/CC impacts, which manifest unevenly across rural and urban landscapes understanding of community as a 'spatial' as well as a social unit will allow for greater attention to geographical variance

in livelihood and vulnerability patterns (Murray, 2002). In sum, space and livelihoods intersect in complex ways and space operates as enabling or constraining mechanism for livelihood systems (Murray, 2002).

8.7. Multi-scalar 'stress bundles' across the rural-urban continuum

The results do not point to a clear-cut distinction between rural and urban household vulnerabilities. Rather, disparities are more closely aligned with broader household characteristics relating to income and access to basic services. While poor and wealthy households are certainly not homogenous groups, and show a wide spectrum of differentiation, low-income households across the rural-urban continuum appear to have similar vulnerability profiles and have similar experiences and responses to climate extremes and change. GEC/CC and DRR literatures identify specific distinctions between rural and urban vulnerability drivers. For example, Moser (1994, in Pelling, 2003: 56) attributes higher general vulnerability of the urban poor to weaker social and economic support networks than rural counterparts. My empirical findings partly support this contention as evident in the discussion on social networks and *stokvels* above. Nevertheless, broadly speaking, within both eThekwini and Ugu municipalities' rural interiors and urban coastal corridors areas are juxtaposed in terms of wealth and infrastructural resource distribution. As such, rural households suffer disproportionately limited access to public services, markets and often less scope for livelihood diversification than in urban areas where, for example, contract and 'piece jobs' were easier to attain. Judging from the empirical results, it seems inappropriate to render rural or urban households (e.g. according to income or location) as more or less vulnerable or resilient to climate variability and change, especially due to the dynamic nature of vulnerability in the context of GEC/CC pressures.

It is necessary to consider divergent situational contexts and identify urban- and rural-specific drivers of vulnerability or conversely resilience, while recognising the interconnectedness and bidirectional interactions characterising the rural-urban continuum. Fragkias (2007: 25) indicates that individual cities have unique 'stress bundles' comprised of environmental factors (e.g. combined effect of sea-level rise and storm surge), that interact with physical characteristics (e.g. flood-prone areas) and socio-economic inequalities (such as segregation and income inequalities), which fuse to create divergent vulnerability contexts for urban inhabitants. I argue that Fragkias'

(2007) 'stress bundle' concept is applicable to various scales (ranging from household to national scales) and to both rural and urban areas. Variable 'stress bundles' can best be identified through the integrative research approach I adopted that accounts for climatic and non-climatic vulnerability drivers as communicated by research participants and my independent complementary empirical observations.

In sum, the inequality in SA is a great challenge to the design and delivery of relevant and appropriate adaptation measures to heterogeneous income and cultural groups across the country. In order to overcome these challenges, unique multi-scalar stress bundles need to be accounted for in order to enable adaptation policy and strategies to reflect the diverse environments within which people exist. In other words, there are no 'one size fits all' adaptation approaches or silver bullet solutions that will enhance adaptive capacity to climate variability in the study sites. Enhancing adaptive capacity will require context-specific adaptation measures. I argue that socio-environmental justice concerns should be at the forefront of such measures and it is to this issue that the discussion now turns before undertaking a more detailed investigation of institutional dimensions and governance in the context of climate variability and change.

8.8. Social and environmental justice concerns: an ecological approach to environmental rights in the research contexts

The apparently stark social differentiation of vulnerability and capacity to adapt among social groups necessitates an explicit consideration of environmental and social justice issues in GEC/CC research and policy. Importantly, PE emphasises emancipatory outcomes of environmental policies and practices (Peet and Watts, 2004; Loftus, 2009). Vital to such outcomes is ensuring that existing socio-environmental injustices are not further ingrained in the context of GEC/CC. As alluded to in Chapter 2, in the SA context, this will require unlearning of embedded ways of thinking, largely influenced by 'northern' understandings and the apartheid era to enable the development of locally relevant and innovative environmental/social justice approaches for framing GEC/CC initiatives. From a PE perspective it is crucial to avoid the imposition of static, essentialised views of socio-environmental justice (Forsyth, 2008). A major consideration for the research context is the pervasive 'environment versus development' discourse or myth (underpinned by the nature/culture dichotomy), held by

many stakeholders at various scales. In the context of pressing developmental concerns this dualistic perspective risks environmental concerns being 'traded off' for development priorities as if social and ecological systems are separate and separable (Simon, 2011; Patel, 2008; Scott and Oelofse, 2009).

In light of these concerns, and conscious of the desire not to impose essentialised socio-environmental justice views, but to strive for democratic resolution, I argue that a *locally driven and tailored* 'ecological approach to environmental rights' (see Section 2.8.2) can appropriately guide the development of adaptation policy and practice. In juxtaposition to the approach of individual human rights, the ecological approach to human rights advocates a balance in terms of anthropocentric and ecological concerns (i.e. it emphasises their inseparability) in environmental/social justice frameworks (Bosselmann, 2001). This is viewed as an appropriate approach for addressing differential vulnerabilities and justice concerns in the municipal contexts due to the necessity of placing environmental concerns associated with GEC/CC within a balanced environmental/social justice framework in order to prevent deepening antagonisms towards environmental issues.

8.9. Shifting focus – the role of government institutions and public – government relations in shaping adaptive capacities

Thus far, this chapter has demonstrated that the barriers and opportunities to adaptation differ significantly between households and neighbourhoods across municipal landscapes. The case studies represent a microcosm of the juxtaposition of GEC vulnerabilities in the SA context and beyond. My focus has been on the local household and community scales, while highlighting various ways in which vulnerability and resilience at these scales are embedded within institutional frameworks and influenced by local government's policies and actions. In turn, local governments are influenced by higher government spheres and vice versa. Chapter 2 reviewed key literature on multi-level governance frameworks and proposed the centrality of effective horizontal and vertical multi-scalar governance for contextually appropriate GEC/CC adaptation. However, the preceding chapters have revealed key barriers to collaborative multi-scalar governance and shown that in the SA context CC has been addressed in a predominantly hierarchical fashion.

To conclude the empirical analyses, the following section focuses on the role of government institutions (specifically local government) and society-state relations in shaping household and community adaptation options and capacities. Of course, household actions and perceptions of government also have direct impacts on adaptation measures implemented at all government scales, thus these aspects are considered jointly. Findings from the various sites within ULM and eThekwini provide important insights into municipal − public relations and the political ecology of vulnerability to GEC, specifically flooding and other extreme weather events. As exemplified in the previous chapter and throughout the thesis, livelihood decisions and household adaptive capacities are not determined within an institutional vacuum. Rather, these are embedded in underlying political economies and multi-scalar institutional frameworks. Indeed, multi-scalar institutional frameworks constrain or facilitate adaptive capacities through governing the context within which these (in) capacities develop.

Chapter 3 explored SA's institutional and political transformation in detail, highlighting that this democratic transformation has opened up opportunities for all citizens to participate in decisions about environmental and developmental plans and processes that affect their lives and for the integration of socio-environmental concerns into all development decisions. Nevertheless, as the following discussion demonstrates, there is a vast disconnect between policy rhetoric and reality, since these legislated opportunities have not adequately translated into actions or significant transformations of development agendas to match this awareness. This applies to the broader SA context, not only to my study sites.

Major reasons for the disjuncture between policy and action relate to inadequate resources and capacity amongst SA local governments, which have created difficulties in meeting their core environmental infrastructure, basic housing and services responsibilities. Under-capacitated and under-resourced rural municipalities such as Ugu have struggled more than better-resourced urban municipalities such as eThekwini in fulfilling their developmental mandates. This chapter has demonstrated that vulnerability to flooding and other extreme events has been exacerbated by inadequate provision of basic services, local government failures to expand and maintain storm water drainage and existing drainage systems. Crucially, however, major drivers of vulnerability do not lie only in funding and capacity restraints but also inappropriate

developments where the inseparability of SES is disregarded and local socio-cultural circumstances are not accounted for. As such, underlying drivers of household vulnerability to GEC/CC are rooted predominantly in poor urban governance and inadequate planning. The following discussion illuminates several key examples of politically and economically motivated government-led developments within both municipal areas, which have given scant regard for the sustainability of socio-ecological support systems in the context of GEC/CC pressures.

8.10. Developing with GEC/CC considerations at the forefront or on the backburner? The power of politics and economic interests

Section 8.2.3 explained that Umzinto, including Ghandinagar, RSP and Sinathan informal settlement were particularly hard hit by the June 2008 storm event. To reiterate, together with people from nearby affected rural areas, Sinathan residents whose houses had been destroyed were relocated to Thokoza transient settlement. Despite the fact that the 2008 flood event was fuelled by unusually high rainfall, many residents from each of these ULM study sites feel that the local government is responsible for the severity of flooding impacts on that occasion, as well as previous extreme events. Key reasons for attributing this blame included inappropriate housing sites (e.g. floodplains) allocated by local government, inadequate and unmaintained storm water infrastructure and local government failure to prepare for extreme events. The interesting aspect about Ghandinagar, RSP and Thokoza is that they are government-led housing developments,[94] built very near and within floodplains (see Plates F to I and Appendix IX for floodplain map). Ghandinagar is a particularly contentious site, where residents are engaged in ongoing disputes with local government over flood protection and relocation issues.

A local environmental consultant (E5) described the inappropriateness of the site as follows,

> I mean the very fact that Ghandinagar, how and where it was built, is proof that way back then in the late 80s and still now, providing housing is politically charged: 'gosh there's a piece of land, we need houses for our Indian people for the Indian vote, lets get in there'. So, ja, it was mainly an inappropriate politically motivated decision. It's an unstable floodplain settlement with inadequate drainage, it's a nightmare.

[94] Some Ghandinagar and RSP residents have recently been awarded title deeds from the municipality. However, some interviewees claimed that the municipality was doing this to avoid taking responsibility for flood protection measures.

Section 8.2.3 outlined the widespread flooding damage experienced by Ghandinagar households. Most participant households relayed feelings of living in extreme fear of floods and expressed disappointment in support and lack of preventative action taken by local government. A Ghandinagar resident (I9) described his family's experience 2008 flooding experience as follows,

> We were so afraid we were going to die, the river was like an evil snake wrapping around our house, we were trapped like caged animals. The municipality came the next day, helped with some things at first, promised relocation and protection then disappeared; they don't care about us here.

Following the flood devastation, the provincial government allocated disaster funds to various KZN municipalities to assist recovery. According to the Ghandinagar FVC, the local council led approximately 35 Ghandinagar households located right on the river edge (see Plate F) to believe that a portion of the funds would be allocated for relocation to suitable land after being flooded in 2008 and several times prior to this: "We were promised in June last year (2008) that we would be relocated, but we are still here, we have heard no more word on that, there is a lack of urgency but lives are at stake here" (E2). When questioned about the delay on 22 September 2010, a local ULM representative (B2) rationalised, "the reason that the Ghandinagar relocation process is taking time is because we want to make sure that the new piece of land is appropriate and the residents don't have repeated flooding experiences". However, on 20 July 2011, in obvious contradiction, the same municipal official (B2) confirmed via email, "Due to financial constraints Council has opted not to relocate people but to upgrade infrastructure to reduce the impacts of flooding on households". In the interim, flood control infrastructure has been installed, yet several Ghandinagar respondents felt that this has actually exacerbated flooding: "the municipality put in a tunnel structure that was supposed to help with runoff and flooding but the restructuring has made things worse; it was not thought out properly and endangers our lives more" (S27). The newspaper article (Thompson, 2011) in Appendix VIII titled 'Tenth flood yet still no help – heartbreak and cynicism go hand in hand as council fails, yet again, to help those in need' (written after widespread flooding in the KZN province due to extreme rainfall on 27/11/11) focuses on the flooding experiences of Ghandinagar residents; clearly reiterating the main arguments I have presented here.

Plate F: Transect of Ghandinagar floodplain housing site in June 2008 (Photo provided by ULM)

Similar tensions arose in the nearby RSP settlement, which was also ravaged by the 2008 floods.

In June 2009 the municipality allocated a portion of disaster funds to a river protection gabion structure, approximately 500m in length, running through RSP (see Plates G and H below). The installation of this structure was underway during my fieldwork period and most (23/30) survey respondents expressed dissatisfaction about the structure, predicting that flooding would persist and accusing the municipality of mismanaging disaster funds. During focus group (F1), an RSP resident expressed her opinion on the prevailing situation,

> I am a firm believer in the saying that actions speak louder than words...that doesn't happen here, just empty promises. Nobody has assisted us, we are sitting ducks and as for the riverbank, I have no faith that this river grading is going to help; the same thing will happen again. We don't trust the municipality on how they are using the funds.

Some might claim that anticipatory mitigatory (in the sense of reducing CC impact) and adaptation measures have been taken in both RSP (gabion structure) and Ghandinagar (new drainage channels, tunnels etc.). However, it is important to challenge the appropriateness of implementing such mechanisms on a floodplain, particularly in the longer-term as GEC/CC impacts intensify.

Plate G: RSP river grading project underway 2/10/10

Plate H: RSP river grading project near completion 5/10/10

Government support for GEC adaptation and responses to extreme climatic events is critical, especially for poor and marginalised populations. However, certain local government decisions and actions relating to various developments have actually placed households and communities at greater risk of GEC impacts, particularly in the long-term. Indeed, despite several notable exceptions (see Chapter 3), local and national governments continue to act in contradiction to their rhetorical claims regarding the need to prepare for and act on CC and address socio-environmental injustices. These actions frustrate local communities and send confusing signals to the public regarding government commitment to addressing GEC/CC.

For instance, Thokoza transient settlement, which was approved by the Provincial Department of Housing (now KZN Human Settlements Department) in 2008 to house flood victims, is situated approximately 3km upstream from RSP, built within metres of the Umzinto River, on a wetland, without flood protection measures. A key representative from DEARD (F1) explained that the Department had been advised against this site, yet, for 'political reasons' it went ahead, with approval from the local council. Further, a prominent local consultant (C5) expressed her concerns about Thokoza as follows,

> There was no EIA done, no engineering assessment. We sent a representative to object and she was told that it is none of her business; it was a purely political decision. They needed to provide housing for people so instead of looking for appropriate sites, they put them on the same river that flooded and killed people. Politicians want votes, they don't have humanity; people's lives are being destroyed and so is the natural environment.

The ‘temporary’ settlement appears to have become semi-permanent in nature since, as of late 2011, most households (25/30) reported that they had not been told when and where they would be relocated to formal RDP housing: “it is supposed to be temporary but there is no sign we are leaving” (S13). Scores of residents share a handful of water standpipes and poorly serviced portable toilets. The housing units have been built with unsuitable materials (see Plate I), which are not heat- or extreme weather-resistant and have very little ventilation. Moreover, these houses are not serviced by storm water drainage and the area was visibly wet with stagnant water after heavy rains, thus risking disease outbreaks. As such, the houses and settlement infrastructure are not adapted to existing and predicted climatic conditions and are therefore unsustainable and exacerbate occupants’ vulnerability. Most Thokoza residents expressed concerns about the dangers of living on a floodplain, as well as the general lack of services and sub-standard housing materials. Box 11 captures several concerns raised by Thokoza households. The responses were given in reply to the question, ‘what influences household vulnerability to GEC/CC?’

Box 11: Household perceptions of Thokoza housing settlement

S3: “the government must stop building houses next to the river and the slopes because floods might affect people. We are confused why the municipality makes these bad houses”.

I1: “this place is near the river, I fear in the night the river will come up and everyone will die; it is not safe to build here”.

S30: “the houses we are provided with after that flood are not good, they are easily affected by fire in heat and are near the river on flat land; if it rains and floods it will easily flush us”.

In light of the responses in Box 11, it can be argued that government actions have contributed directly to livelihood vulnerabilities through building government housing on known floodplains and failing to address these vulnerabilities adequately when funded opportunities arose. In sum, poor planning and inadequate long-term solutions on local government’s behalf have left many flood and storm event victims more socially and biophysically vulnerable than before. This argument applies to all three Umzinto study sites.

Plate I: Thokoza transient settlement housing units

Furthermore, RDP houses are a pervasive feature of post-apartheid development. Government-subsidised housing is essential to support vast low-income populations in attaining formal housing. However, RDP housing has been widely criticised for being sub-standard, with poor building materials and inefficient ventilation (e.g. Menguelé et al, 2008; Lemanski, 2009; Marais, 2011). Furthermore, in the SA government's desperate attempts to deliver housing at a fast pace, it appears that the houses are not being built with predicted CC impacts in mind (i.e. maladaptive housing). As an Ugu municipality representative explained,

> Those RDP houses are no good for climate change impacts: they lack ventilation, they are built with poor materials, they have no proper toilets. Diseases like TB thrive and become the norm in RDP settlements. The thing is with this type of development, people, on a day-to-day basis, are living with all these problems, so now you put climate change impacts like heat and floods on top of that. We need to think of those things.

The above discussion has focused on the complexities and challenges to adaptation imposed by certain problematic pro-poor developments. Various recent concurrent problematic pro-growth developments also pose barriers to appropriate GEC adaptation. To reiterate, in the SA context, neoliberal development paths are led by the concurrent

pro-growth and pro-poor agenda, which thus far, has been dominated by ecological modernization thinking (see Chapter 3 and 6).

Both eThekwini and Ugu municipalities have approved several politically and economically strategic private and public-private developments with apparent disregard for CC/GEC threats, which have created increased GEC/CC vulnerabilities at various scales. For example, during the 2008 storm event, which affected Amanzimtoti, as described above, Poinsettia Old Age home as well as several houses along Ocean View Road (both within the case study area) were completely flooded out and many residents had to be evacuated. Plate J illustrates the devastation to property on Ocean View Road caused by the landslide.

Plate J: Ocean View Road landslide destruction (Photo provided by participant household)

While extreme rainfall provided the catalyst for flooding, extensive vegetation cover (golf course and trees) adjacent to the affected neighbourhood had recently been converted to a large-scale shopping centre (Arbour Town), thereby increasing surface runoff. The environmental control officer (ECO) (C3) for the development explained,

> Arbour Town should never have gone ahead, in terms of environmental concerns. It is one example of many in the city that should not have been approved but went ahead for economic and strategic reasons. It was so badly built and planned, it's near a dangerous pipeline and has a real lack of drainage; that is why we saw those major landslides happening. We live in a developing country: there has to

be development. We aren't going to and shouldn't stop development but it does need to be done in the most appropriate manner in terms of environmental considerations and we are not seeing that.

8.11. The role of politics in environmental decision-making and emphasising the inseparability of social-ecological systems

Viewed through a PE lens, the above discussion signifies the importance of considering the influence of political dynamics in environment and decision-making, as well as the role of unequal power relations in shaping GEC/CC vulnerability landscapes. Attention to political and economic causality is critical to ensure that environmental change and problems are not treated as separate from the wider context in which it is embedded. In accordance with Pelling and Wisner's (2009) argument, there is a pressing need in rural-urban systems for planning to continually evolve and account for GEC/CC effects and to be protected from economically and politically powerful elites who attempt to disregard planning principles for economic gain. As explained in Chapter 2, PE's central unifying idea is "the desire to politicise environments as a way of changing them" (Loftus, 2009: 954). Evidently, planning, controls and development paths administered by government bodies are of a fundamentally politicised nature. So too, then, are state-led and private-public GEC/CC actions highly politicised processes, which require careful investigation if socio-environmentally fair and just adaptive decisions and actions are to be made.

Informed by PE thinking, I have emphasised the inappropriateness of the supposed 'nature-society' dichotomy. However, it is evident that several pro-poor (e.g. Thokoza) and pro-growth (Arbour Town) developments have overlooked the interconnectivity of SES (as if separate and separable systems) in favour of economic and political interests. The pervasiveness of the dualistic 'environment versus development' perspective, which has created major tensions at local government levels has been illustrated. Chapter 6 explained that according to local officials, many politicians and other powerful decision-makers also see environment and development concerns as competing rather than intricately linked agendas. In light of this contention and given their decision-making power, many local officials felt that politicians and political agendas are therefore currently hampering CC adaptation initiatives (see Chapter 6). However, as previously emphasised, politicians are also led by public demands and the environment versus development myth is also pervasive at local levels. To illustrate this

point it is useful to draw on an example given by a locally prominent environmental consultant (E5),

> In Inanda I'm working with a community where we negotiating proposed housing sites. The meeting was well attended but they couldn't have given a continental about the environment. They want the houses and said things like 'you mustn't worry about that, we want the houses', to which I replied, 'but now guys you've got some very special grasslands and biodiversity. Most then said 'no, no, no don't worry about that'. One guy says to me, 'where are all these special plants'? I told him they are all over the place, so he said 'well tell me where and I'll go take them out and you won't have to worry about them!' At the end I said guys we'll be in contact but please understand this is a long process. The same guy gets up and says to me 'no, *you* go to the government and *you* tell them they must get this right now!'

The slightly dismissive tone of this statement notwithstanding, it serves to reiterate the major barrier to adaptation created by dualistic perspectives towards SES. While provision of housing and basic services is an urgent priority, these will not be sustainable if underpinning environmental considerations are not taken into account. Natural assets are interconnected with all other assets and underpin optimal functioning of SES. Thus, the pervasive tendency to overlook nature-society or environment-development relations at various scales in the study contexts, and in SA more broadly exacerbates social and biophysical vulnerability and is a key barrier to GEC adaptation.

8.12. Towards addressing the root causes of vulnerability: A focus on transformative adaptation

As exemplified, scalar considerations are central to GEC adaptation because individual or household-scale adaptations are constrained or facilitated by government actions and policy at various scales. The above analyses illuminate the inappropriateness and unsustainability of many aspects of eThekwini and Ugu/ULM's development trajectories, including certain maladaptive actions. As a result, inequalities and injustices between different societal groups are becoming further entrenched. This evidence strongly reinforces my contention that adaptation to CC can perhaps most appropriately be supported through addressing climate-related stresses while transforming or revising existing development policies in order to root out the underlying causes of vulnerability and increase livelihood resilience in the face of multiple stresses. The following statement, by an Ugu official (B5), sums up justification for this argument,

> The government puts sub-standard houses on floodplains and other ridiculous sites for poor populations. You see you didn't get them out of poverty in the first place, you created a cycle of poverty and this is how we deliver services and development here. Then, what happens after floods, government comes around and looks at the damage and what do they do? They rebuild in the exact same place. Due to pressure to deliver services, the government is not getting people out of poverty, they just saying, ok, here's your house, see you after the next flood! So what I'm trying to explain is that we are the victims of our own development. So now, how do you adapt, how do you mitigate in this situation?

Livelihood vulnerabilities are shaped by the prevailing inequitable development context, with climate variability and extremes adding further pressures. In other words, the underlying root causes of vulnerability are sometimes more significant than climate variability and stresses in determining risk. My empirical findings also reveal the state's failure to uphold the 'social contract' (see Chapter 2), since although housing has been provided (meeting rights), the linked responsibility of building on safe sites has not been upheld. As Pelling and Wisner (2009) point out, risk and vulnerability are always present in society, but they become unacceptable when caused as a result of governance systems failing to uphold the social contract. It is these underlying causes of vulnerability that need to be addressed in order for adaptation to be successful and avoid vulnerability becoming an inherent feature of SA society. This argument applies to many developing, as well as developed contexts.

While mainstreaming CC adaptation has the advantage of ensuring that CC concerns are not marginalised in favour of pressing development priorities, the empirical results underscore the salience of Schipper's (2007:7) argument that "mainstreaming will not be effective if existing development trajectories are inconsistent with the objectives of adaptation, i.e. if they explicitly contribute to vulnerability". Therefore, drawing from Pelling's (2011) 'resilience-transition-transformation adaptation framework' (see Chapter 2) it appears that a focus on the benefits of 'transformative' adaptation is appropriate to the research context. This focus is appropriate since transformative adaptation is concerned with addressing root causes of vulnerability and supports revision and replacement of existing development paths and social contracts, while protecting existing positive. Such an approach can help to ensure that adaptation measures are sustainable and account for prevalent social and environmental injustices.

Addressing root causes of vulnerability should be central to both development and adaptation policy with explicit recognition of climate stress as one of many (albeit

pivotal) drivers of vulnerability to GEC/CC. Sustainable development and vulnerability reduction provide the foundations for GEC/CC adaptation (Schipper, 2007). However, rooting out the underlying causes of vulnerability poses significant obstacles since challenging the status quo, especially to radical extents, is often contradictory to political and economic vested interests. Therefore, the impetus for transformative adaptation will need to come not only from government institutions, but also from all societal actors from individual to national scales to drive radical change in current development paths. This further reiterates the importance of multi-scale action. To clarify, I recognise that transformation of unsustainable development paths is a long-term and ongoing process, as is adaptation. I am thus not suggesting delayed adaptation action, to the contrary, I advocate that immediate adaptation measures are critical. However these adaptations can best be informed by a transformative focus where current inequalities and root causes of vulnerability are centrally accounted for so they do not become further entrenched.

8.13. Scepticism, lack of faith and mistrust towards government institutions

Multi-scalar governance requires that horizontal and vertical inter-governmental relations and communication be considered, as well as relations between government institutions and local stakeholders. Many factors shape the relationship between the state and society, and hence the development of joint adaptation initiatives and therefore cannot be viewed in linear or dualistic terms. With this in mind, the following discussion illuminates certain prominent relational aspects that arose through empirical investigation, including political tensions and complex power dynamics between local communities and government institutions and politicians. These aspects have adverse implications for adaptation measures at various scales, especially those that require joint multi-scalar efforts between government and non-government stakeholders.

Section 8.2 revealed household antagonism towards local government, influenced by perceived inadequacy of government responses to flooding and extreme events and inappropriate developments. Indeed, the majority of respondents in all study sites were very critical of local and national government and politics more generally. As I8 says, “We are all caught in the middle of political games here; the politicians play us off. We only see the government people just before the elections and they promise us all sorts of things but, then we hardly see them again and nothing changes”. Distrust of and

animosity towards all levels of government are widespread in the SA context (as in many other countries). This is attributable to several underlying factors such as the inequitable apartheid and post-apartheid political-economic order, disappointment in inadequate basic service and infrastructure provision, as well as post-apartheid reconstruction. Marais (2011: 216) sums up the current SA socio-political context as follows, "the anger stems also from the poor quality and uneven provision of services, the lack of democratic participation in local development, indifference towards citizens' complaints and a brash culture of self-enrichment among local officials". Examples below highlight various tensions that influence how adaptation to CC unfolds in the research contexts.

Mistrust and dissatisfaction towards government institutions were prevalent across socio-economically and racially diverse households. Indeed, many interviewees from all study sites expressed concerns over municipal performance and planning, incompetence, funds mismanagement, maladministration and inadequate maintenance of key infrastructure. Households expressed disgruntlement about local politicians and bureaucracies, with much mistrust stemming from widespread allegations over corruption – a regular national news feature during my fieldwork and prominent concern raised in the local context. A Park Rynie interviewee (I5) summed up often-cited concerns as follows,

> We are more vulnerable because the municipality has blocked off natural water flows in this area. They have put in inappropriate infrastructure that increases storm water flow and flooding. They are also bankrupt because they mismanaged funds and they are corrupt to make it worse. Our vulnerability is in their hands now.

Many citizens from eThekwini (e.g. Isipingo and Kwamakhutha) expressed frustration and disappointment at municipal and national government performance. However, municipal − local relations were particularly tense in the Ugu/ULM (Ghandinagar and RSP) context where many households showed intense opposition and frustration to local government institutions and politicians, "we are very angry that nothing has been done, its all talk and no action" (Ghandinagar, S4), "the municipality is a circus" (I14), "they are rogues the government, they don't listen to us here at the grassroots even though we vote them into power; I prefer the apartheid days" (RSP, S1). Arguably, the more pronounced animosity and lack of faith towards local government in the Ugu/ULM context can be linked, partly, to the divergent municipal capacities and

resources for supporting local communities (and by extension supporting local adaptation efforts), as well as the predominantly conflict ridden nature of relations between local government and local citizens.

Regarding GEC/CC actions, a few respondents were sympathetic towards local and national government's efforts, stating that "they are trying" (I27, I 18) and "they are starting to address climate change amongst all their other worries" (S18, Isipingo). Nevertheless, for the most part, respondents in all sites showed a lack of faith in government abilities to address GEC/CC and expressed concern over political will and conflicting interests. Regarding government responses to CC/GEC, only 15% of 300 survey respondents were 'satisfied' with local government CC actions and 19% were 'satisfied' with national government's CC actions. Box 12 illustrates key household viewpoints on local government's ability and willingness to address GEC/CC and environmental issues.

Box 12: Household perceptions on local government's response to climate variability and change

I4, Park Rynie: After the big storm surge and flood events, local government did not put in any new infrastructure or do things differently, they only repaired some damages so the same things will recur. There are no new safety measures in place. They are only worried about developments that are going to line their pockets.

E5, RSP: The council doesn't listen to us ordinary people. Councillors are not aware of and educated about these environment and climate change issues, it's not something that is a priority for them

I26, Amanzimtoti: The municipality don't have sufficient funds to function and the environment is not top on their list, let alone dealing with climate change. Politics is their main concern. There is literally no action, nothing that is going to make a difference anyway.

The quotes in Box 12 show that despite the fact that both eThekwini and to a lesser extent Ugu/ULM municipalities are indeed rolling out GEC/CC actions and campaigns (see Chapter 6), these do not appear to have impacted local levels to a large extent and there is a distinct lack of faith in local government abilities. Similar viewpoints regarding national government emerged. As a Hillcrest resident (I36) exclaimed, "Oh please, our national government won't do anything, not even on climate change. They will take whatever money is allocated but nothing will change, the same as with

poverty". Further, an Amanzimtoti respondent (S4) opined, "I don't have much confidence in national government and climate change, judging by their performance at summits like Copenhagen, it is not a genuine concern". The 2007 South African Social Attitudes Survey (SASAS) revealed a higher satisfaction rate than my data, with 33% being satisfied with government's CC response (HSRC, 2008). Nevertheless, 29% were dissatisfied and 'don't know' was the most frequent (40%) response, which reiterates the general lack of awareness about what government is in fact doing (HSRC, 2008). Beyond the national context, the 2009 World Public Opinion.org (WPO) poll[95] revealed that the majority of participants in 15/19 nations including China (62%) and the US (52%) believe that their government should giver higher priority to CC than it did at the time (WPO, 2009).

The negative attitudes towards local and national government and politicians described above are one of the overarching barriers to adaptation at all scales, specifically measures that require co-ordination and co-operation between local communities and various government levels. For example, local citizens may not follow advice from government institutions, as they are considered corrupt and not trustworthy. Municipal-led GEC/CC measures require support, input and co-operation from individuals and households affected by such initiatives. However, as demonstrated in this Chapter, the most politically powerful voices with vested interests shape environmental decision-making and outcomes, while meaningful participatory governance is sidelined. This lack of communication and engagement is a major catalyst for distrust and conflict between local populations and local government.

The importance of participatory and deliberative decision-making, as well as political power to influence development and other decisions, were emphasised as crucial aspects by many households and most government officials interviewed. As Chapter 2 outlined SA's legislated co-operative and decentralised governance approaches are potential important 'cultural resources' (after Heyd and Brooks, 2009) for supporting such valued aspects. Nevertheless, most respondents expressed powerlessness to influence municipal decisions and policy (despite several concerted attempts) and were frustrated by the lack of accountability and transparency shown by local government

[95] WPO.org is an accredited source, managed by the Program on International Policy Attitudes (PIPA) at the University of Maryland, USA. (http://www.worldpublicopinion.org)

institutions and politicians. Thus, there is a vast disjuncture between government policy and discourse and concomitant actions.

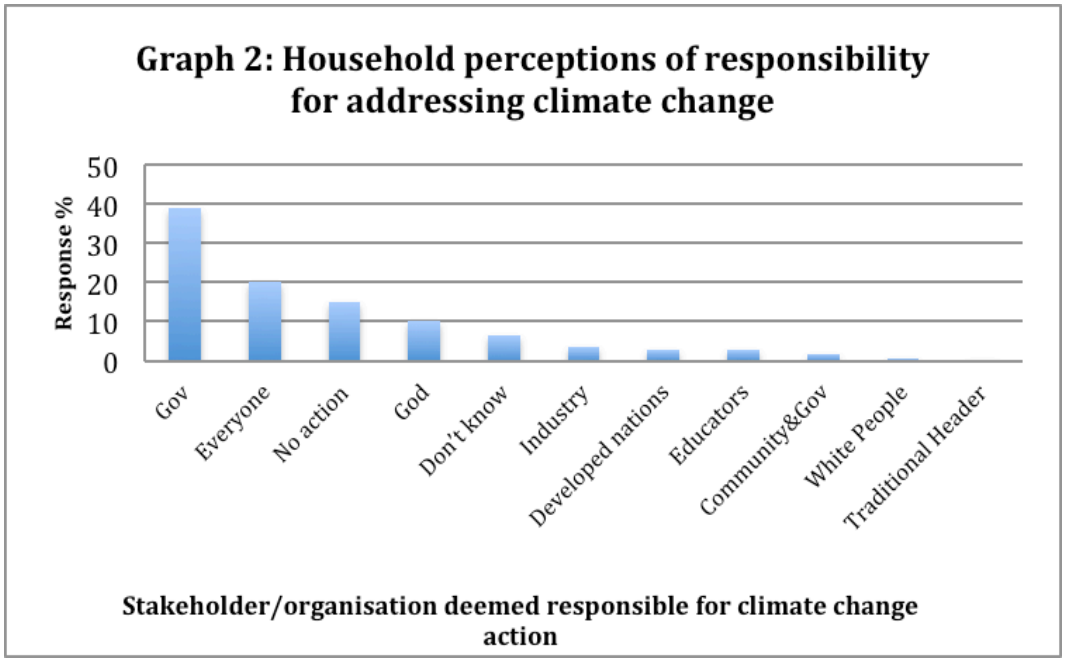
Meaningful involvement and influence of grassroots actors is fundamental to multi-level governance and necessary to facilitate contextually appropriate local developments and GEC/CC adaptation policy and measures. Although still in its infancy, eThekwini Municipality has initiated a 'Durban Climate Change Partnership' (DCCP) that aims to bring together large numbers of diverse stakeholders including grassroots actors, NGO representatives, business and governmental officials in a coordinated manner to address adaptation and mitigation issues (ASSAf, 2011). eThekwini's various other adaptation efforts such as the 'Climate Smart Communities pilot project' (see Appendix VII) focus on municipal-community collaboration. Ugu/ULM has also started to engage local communities and attempted to forge partnerships with local communities over 'greening' and other initiatives. Despite these significant advances, collaborative, networked governance continues to pervade the case study and SA context more broadly, which hampers necessary collaborative adaptation efforts. As an important caveat, even if an enabling and participatory environment is developed, where local people are empowered to influence GEC plans and actions meaningfully, this does not mean that the opportunity will be seized. For example, as the following concluding discussion shows, public attitudes about responsibility for addressing GEC/CC strongly influences the extent to which local people engage with GEC/CC issues.

8.14 Viewpoints on roles and responsibilities

Due to its multi-scalar and broad-ranging nature, all societal actors across multi-levels have a role to play in mitigating and adapting to GEC/CC, irrespective of GHG contributions (Adger, 2003). However, as indicated in Graph 2 below, many of my informants do not necessarily share this viewpoint of *collective* responsibility.[96] Survey and interview respondents proposed various actors as having the responsibility for taking action on CC causes and impacts. In support of shared responsibility, 20% of respondents noted that 'everyone' is responsible for GEC/CC action: "we are all responsible", 15% believed that 'no action' could be taken (mostly because respondents either associated GEC/CC with supernatural forces or viewed it as a natural

[96] Graph 2 and related discussions in the text represent an aggregation of responses from all survey areas.

phenomenon, thereby precluding human intervention) and 10% believed that only God can influence GEC/CC. Significantly, however, 39%, almost double the second highest response, indicated government responsibility for action. Here, predominant survey answers were that 'the government must take action/do something', with very few specifying which sphere of government they believed to be most responsible. However, during in-depth interviews, 88% of respondents clarified that they believed that all government spheres are responsible, while 8% allocated local government responsibility and 4% national government.



These perceptions about responsibility for GEC/CC action illuminate several significant characteristics about residents in the study sites, which have important consequences for potential adaptation measures. Apparently, there is considerable confusion over responsibility and appropriate scales of action for various CC interventions. However, the majority of respondents view the responsibility for addressing GEC/CC as beyond individual control and lying instead with government and supernatural forces. Thus, this implies that most households do not feel that the responsibility lies within their household or individual household members. The pivotal influence of religious faith and cultural beliefs in shaping perceptions and responses to GEC/CC is examined in detail in Chapter 7 and is thus not revisited here, except to reiterate the centrality of these in shaping GEC adaptation in the study contexts.

Importantly, government institutions were principally blamed for the *impacts/effects* of climate variability and extremes such as adverse flooding and extreme weather, as well as the *causes* of GEC/CC such as inadequate investment in renewable energy. In response to the survey question 'what type of actions can be taken to address climate change?', 14% of household representatives said 'reduce pollution' (most popular response), and 13% felt 'government must take action' (see Table 8 in Chapter 7 for full list of responses). Here, specific actions were seldom explicated; respondents simply assigned government responsibility for action, thereby denying personal responsibility. Further, it became evident during surveys and interviews that many respondents felt government institutions are also responsible for pollution reduction through, for example, stricter industry regulations. Denial of individual and collective responsibility may have far-reaching consequences for adaptation. This prevalent viewpoint amongst households on government's role and responsibility is somewhat contradicts the concurrent mistrust and lack of faith towards local and national government described above. Linked to tendencies to assign government responsibility, the following section addresses the apparent emerging dependency on government institutions among local actors for addressing GEC/CC.

8.15. Reliance on government institutions for CC action

As a central actor group, local citizens have a responsibility and role to play in developing their own household- and community-level responses and adaptive mechanisms, irrespective of government policy and action (Adger et al, 2003). Despite potential for adaptive actions at these finer scales, the empirical results indicate that many households, especially low-income marginalised households, are reliant on and expectant of assistance from local government in disaster situations and for taking adaptive actions. In addition to tendencies to assign government responsibility for GEC/CC action (39% of survey respondents), many households (e.g. 21/20 in Molweni and 22/30 in Kwamakhutha), particularly in low-income neighbourhoods, coped with floods and extreme storm events by relying primarily on government support for emergency supplies and housing reconstruction. Moreover, very few household- or community-scale anticipatory adaptation measures have been initiated. Thus, the present situation in most of the study sites points to a possible emerging dependency pattern in terms of responding to and preparing for the impacts of climate variability and change.

To date, much of the government support that households depend on has been in the form of relief or once-off assistance after flooding and storm events and does not reduce underlying drivers of vulnerability, offer long-term adaptive solutions or sustained livelihoods support. Reliance on this type of support without taking long-term adaptive actions such as rallying government over CC action and environmental justice issues, building flood protection measures, diversifying livelihoods or relocating from risky sites such as floodplains is unsustainable in the long-term. Indeed, in terms of adaptation, reliance on government for long-term assistance for food, water harvesting and other adaptive possibilities at the household-scale can be considered maladaptive. This is especially the case in the SA and other developing contexts where government bodies are overstretched and lack essential capacities and resources, macro-economic strategies that focus on maximising the value of environmental and social resources within a neoliberal approach that frames development and environment as competing issues. Moreover, the lack of long-term solutions initiated by governments to date (e.g. locating Thokoza settlement on a floodplain) threatens to exacerbate livelihood vulnerability. Several government interviewees (A6, A7, A8, B1, B2, B6) expressed concern about public dependency on government for CC action and identified this tendency as a key barrier to GEC adaptation at various scales.

In addition to widespread disregard for certain necessary individual and household adaptation measures, collaborative or multi-level adaptation efforts between households or communities and local government were not well recognised by households across socio-economic spectra. In contrast, most government and non-government officials noted the importance of municipal − public collaboration and citizen responsibility to lobby government to take action on CC. It is likely that reluctance to collaborate with local government stems from distrust and animosity towards local government as discussed above. Indeed, from the perspective of local stakeholders, resisting collaboration with local government could be viewed as an important preventive measure through avoiding manipulation or being taken advantage of by government institutions that they do not trust.

I argue that reliance on government support and blame shifting constrains proactive or precautionary adaptive actions at household and community scales, thereby threatening

to exacerbate long-term vulnerability and missed opportunities to lobby government for transformative action in tackling GEC/CC.[97] This situation reiterates the importance of awareness-raising and socially and culturally sensitive education about predicted CC impacts and possible response mechanisms across socio-economic spectrums and different locations. However, as noted, information and awareness raising does not necessarily translate into actions or shifted mind-sets, thereby further underscoring the complexity of motivating individual and household level adaptation.

Crucially, by highlighting concerns about dependency and emphasising concurrent responsibility for GEC/CC action at household and individual scales, it is important to clarify that I am not implying *non-responsibility* on the part of government, nor do I support the notion of neoliberal 'individualisation' of environmental responsibility, which Brand (2007), Paterson and Stripple (2010) and others have criticised. In agreement with Paterson and Stripple (2010: 342), I view individualisation of CC and environmental problems as problematic since it detracts attention from the "fundamentally social and political character of environmental problems". Individual behaviour and practices are not separate from the activities of the state and capital but are part of the reproduction of these very societal structures (Scott et al, 2011) and thus have an important role to play in challenging and transforming these. The key point, then, is that government must play a central role in addressing CC through policy and practice, yet there is a vital need for *concurrent* and concerted GEC/CC action at finer scales that concomitantly challenge inequitable and maladaptive state practices and foster multi-level governance. Local actors need to be empowered to take responsibility for holding government account for legislated commitments, as well as take individual household and community scale responsibility for taking actions to address GEC/CC.

[97] Significantly, while the centrality of relief organisations or NGOs for emergency and development assistance has been highlighted in many DRR and GEC/CC studies, such organisations did not feature strongly in any of my study sites as only 8 respondents from all sites mentioned assistance from NGOs in responding to extreme events. This is not to deny the importance of NGO support in the research contexts, particularly in poverty stricken areas, but in my research respondents reflected on other dominant issues.

Chapter 9: Conclusion

9.1 Introduction and thesis overview

This thesis has applied multiple social science methods to examine perceptions, understandings and responses to climate variability and change, with a specific emphasis on drivers and barriers to adaptation across two main interconnected scales of analysis; the municipal and local household to neighbourhood scales.

This chapter concludes the thesis by synthesising the core findings and suggesting the main contributions to the broad field of study in which it is embedded. I also consider the policy and practical implications of my research findings and identify gaps for future research and how the study could be extended. Chapter 1 provided an overview of the thesis and outlined the main rationale for the study. Broadly, the rationale for this study is based on the argument that, in order for humankind to survive rapidly transforming environments in the context of GEC/CC, we need to know more about how to adapt with, and to, GEC/CC and understand what the key challenges and facilitators to adaption are.

This thesis adds to the growing body of literature focused on the role of local authorities for addressing GEC/CC (e.g. Kern and Alber, 2009; Bulkeley et al, 2009; Holgate, 2007), where transnational municipal networking is often promoted for facilitating municipal responses. The opportunities and challenges to locally created, and thus locally appropriate, adaptation strategies have been considered and the under-researched role and dynamics of localised municipal collaboration, specifically between interlinked contiguous municipalities for GEC/CC adaptation have been investigated. From a research and policy perspective, inadequate attention is still given to trying to understand complex finer scale horizontal and vertical relational dynamics between municipalities and other spheres of government, as well as non-state actors within the emerging human dimensions and multi-level governance GEC/CC literature. This is a nascent research area that this thesis has addressed. Of all government institutions, municipalities have the closest interface and most direct influence on local populations. It thus follows that an interconnected second layer complements the first layer of analysis, where I have explored perceptions, understandings and experiences of climate variability and change within several local study sites, sampled from across the rural-urban continuum and diverse socio-economic and cultural contexts within both

municipalities. This unusually holistic approach was adopted to gain novel insights into differential adaptive capacities, understandings and responses to GEC/CC between diverse socio-cultural groups, which have important implications for adaptation possibilities and constraints.

GEC/CC presents multifarious biophysical, socio-economic and political challenges at multiple scales. Further, although I am particularly interested in understanding human dimensions of GEC, social and ecological systems are intricately connected, therefore requiring that a holistic approach be adopted to frame the interrogation of such complexities. To this end, my theoretical approach is grounded in political ecology (PE), which combines ecological and political-economic concerns and assessments in a single approach to understand the causes and impacts of environmental problems. Within this broad theoretical approach charted in Chapter 2, I have drawn from diverse literature, including vulnerability studies, livelihoods analysis and cultural theory to frame the study. As PE is centrally concerned with multi-scalar analyses, the approach also underpins the multi-level governance framework developed in Chapter 2 that has guided my investigation of horizontal and vertical governance dynamics in the context of GEC/CC. The theoretical framework developed in Chapter 2 facilitates a deeper understanding of the causes of differential vulnerabilities, adaptive capacities and responses to GEC/CC at multiple scales, beyond biophysical events or processes.

The theoretical 'landscape' figure or model developed throughout the thesis and depicted in Figure 1 has important implications for wider GEC/CC adaptation research. While I found PE theory useful for this research, I hope to have highlighted the effectiveness of bringing together other complementary (albeit open to contestation) literatures and theories to extend and tailor PE insights for investigating GEC/CC adaptation limits and facilitators at multiple scales. In other words, by developing a framework of complementary literatures I have revealed the limitations of applying PE to GEC adaptation research but have shown how these can be overcome by drawing from diverse complementary literatures (from a critical perspective) to develop a contextually appropriate PE of adaptation to GEC/CC. As with all theoretical models, the model developed in this thesis is, of course, open to critique. Nevertheless, I argue that it offers a useful and innovative framework for GEC/CC adaptation research in

diverse developing as well as developed contexts, which can be developed further and tailored accordingly.

Chapter 3 provided the contextual foundation for answering the research questions, while Chapter 4 outlined my research approach for empirical data collection and provided justification for the selection of study sites. The research has followed a cross-cultural comparative design where various cases have been explored using the same overarching methodological approach. The methodology consisted of various parts including surveys, in-depth interviews, participant observation, focus groups and policy analysis. In keeping with the rubric of a multi-methods approach, data derived from the various methods were drawn on and combined to answer each of the research objectives. Chapters 5-8 addressed the four main research objectives outlined in Chapter 1 through presenting empirical research findings from my fieldwork undertaken in eThekwini and Ugu/ULM municipalities in KZN, SA. SA was chosen as a country that has undergone significant political and institutional change, including the emergence of GEC/CC as a key policy issue. The neighbouring municipalities and case study sites within them were selected on the basis of diversity of various aspects including politico-administrative organisation and capacity, extension of adaptation planning and action, socio-economic status and population diversity (based on socio-economic groups, settlement patterns, cultural orientations and other considerations).

Several main messages can be drawn from my research findings. These are now considered in relation to the four main research objectives reiterated in Table 11.

Table 11: Research objectives

Research Objectives	Results chapter that addresses the objective
1. To undertake a comparative analysis of whether, to what extent, and how processes of adaptation are taking place in the neighbouring eThekwini metropolitan and rural Ugu district municipalities	Chapter 5
2.To determine the relationship between Ugu and eThekwini and between these municipalities and higher government spheres, and the likely effect of collaboration, or lack thereof, on global environmental/climate change adaptation initiatives	Chapter 6
3. To explore differing perceptions and understandings of climate variability and change and their likely effects within and between the case study sites	Chapter 7
4. To investigate divergent experiences and responses to GEC within the case study sites and consider the influence of municipal-public relations in constructing them	Chapter 8

9.2.1 Responding to GEC/CC in the neighbouring eThekwini and Ugu municipal regions

To address the first main objective (see Table 11) Chapter 5 sought to investigate whether, to what extent, and how processes of adaptation are taking place in the neighbouring Ugu and eThekwini municipalities. Particular emphasis was on understanding drivers and constraints to adaptation within these municipalities.

The chapter reveals that, despite their close proximity, the two municipalities have responded to GEC in very different ways and have very different capacities to adapt to GEC/CC impacts. These disparities stem largely from SA's historic and current inequitable political-economic complex and social ordering, which has given rise to municipalities with disparate resource capacities and development trajectories. Chapter 5 revealed that eThekwini is at the vanguard of GEC/CC action, having prioritised adaptation early on in their GEC/CC response and initiated many progressive CC projects ahead of other local governments in SA, and more widely. Ugu/ULM have been more reactive in their approach and although they have recently started to engage meaningfully with GEC/CC, they lag behind eThekwini considerably. This is representative of the broader SA context where metropolitan municipalities with strong

urban cores and resources have initiated comprehensive GEC/CC plans ahead of their largely rural and less capacitated counterparts.

Several catalysts and drivers for eThekwini's progressive GEC/CC initiatives were identified. These included, amongst several other aspects, the long-term establishment of a dedicated municipal environmental function, strong leadership (CC 'champions'), advanced expertise in environmental matters, as well as a strong and diverse resource base, which supports capacity to provide and maintain vital infrastructure and services necessary for adaptation. Durban has also created strategic partnerships with other external and internal support mechanisms and networks that have supported the municipality's CC agenda in various ways.

These factors did not feature strongly in the Ugu/ULM context, where certain distinct obstacles to addressing GEC/CC emerged. Amongst these, inadequate understanding of and credibility given to the environmental department and its functions within the broader municipal institution were raised as major obstacles. In addition, my results reveal that environmental issues are often viewed in a negative light and as a hindrance by other departments and employees within the local government institution. Moreover, in contrast to Durban, Ugu and ULM's environmental functions are still relatively young, under-resourced and under-staffed. Over and above these distinctive issues, several common themes relating to institutional and operational drivers and constraints to the formation and implementation of GEC/CC adaptation measures were identified. These include weak inter-departmental collaboration and facilitative structures, divisive institutional arrangements and high staff turnovers within municipal functions.

In addition, the results show that various structural constraints and historical and political aspects need to be addressed for effective municipal GEC/CC responses to manifest. In particular, deep-rooted racial and cultural tensions underpin environmental agendas in the SA context, and because GEC/CC is often interpreted as an environmental protection issue, this poses significant challenges to GEC/CC adaptation at all scales. Indeed, the polarised 'environment versus development' discourse appears to be gaining further momentum in the context of pressing GEC/CC concerns, thereby confounding both developmental and environmental goals in the SA context. Crucially it has been widely noted (e.g. Roberts, 2008; Scott and Oelofse, 2009; Bulkeley et al,

2009; Simon, 2011) that environment concerns are often viewed as detracting from and conflicting with critical development priorities in contexts such as the SADC region, where development is still focused on addressing poverty and meeting basic needs. While this is a pervasive phenomenon, it is particularly prominent in the SA context due to distinctive destructive and discriminatory apartheid era policies and practices (see also Leck et al, 2011).

According to most interviewees, high level officials and politicians are also responsible for reinforcing this viewpoint and failing to prioritise GEC adaptation on municipal agendas. Competing political agendas and the politicians driving them evidently play a major role in shaping the GEC/CC agenda, particularly at the local level where pressing developmental concerns and economic growth imperatives often overshadow important adaptation needs (despite their interdependencies). Traditional leaders are also vital actors within the SA governance system and retain a strong influence over African communities and rural land. However, empirical findings reveal that relationships between municipal institutions and traditional leaders are often tense and *Nkosis* do not appear to have been involved adequately in the development of local GEC/CC initiatives. This poses a potential obstacle to municipal-wide adaptation since local communities under traditional authority are more likely to support GEC/CC measures led by influential *Nkosis*, with shared cultural beliefs than from outsiders.

9.2.2 Horizontal and vertical government relations in the context of GEC/CC

Chapter 6 sought to advance analysis presented in Chapter 5 through examining the relationship between Ugu and eThekwini municipalities, and between these municipal governments and higher government spheres (see research objective 2 in Table 11). In other words, horizontal and vertical government relations were the main focus of this chapter, where likely effects of collaboration or lack thereof on GEC adaptation initiatives were considered. Evidently, both horizontal and vertical collaboration are weak and ad hoc in nature. To date, most GEC measures implemented by local government bodies have been initiated independently by individual organisations, with insufficient inter-municipal collaboration and without adequate provincial or national leadership and support. While effective governance in the context of GEC requires genuine collaboration across multiple scales, especially with regard to shared infrastructure and ecosystems, the results show that complex political realities,

combined with power, resources and responsibility disputes, as well as conflicting framings and approaches to addressing GEC/CC, pose formidable barriers to such collaborative governance. GEC/CC policy development has followed predominantly a hierarchical form of governance, despite constitutional commitments to participatory and collaborative governance.

In order for municipalities to forge meaningful and sustained relationships, support structures are required from provincial and national level governments. While, on paper, SA has a sophisticated network of institutional and legal frameworks for potentially facilitating collaborative responses to climate variability and change, these remain weak and largely ineffectual. This is attributable to, amongst other factors, lack of co-ordination, ambiguous roles and responsibilities, inadequate communication structures and conflicting interpretations, approaches and attitudes towards GEC/CC and associated impacts between different governance spheres. My investigations reveal that collaboration between Ugu/ULM and eThekwini over GEC/CC and other initiatives has been hitherto lacking. Diversity of key functions, such as developmental priorities and economic orientation act as barriers to the formation of inter-municipal partnerships, as many officials indicated that they have few commonalities to collaborate over. Representatives from both municipalities openly admit lack of engagement and lip service to governance ideals.

Other barriers, which have also been noted in wider GEC/CC governance literature (e.g. Mokwena, 2009; Carmin et al, 2011; Brockhaus and Kambire, 2009), include, *inter alia,* conflicting priorities, lack of support from politicians, high staff turnovers, which disrupt existing communication channels, institutional constrains, unequal skills and technical capacities between municipalities, and ineffective communication channels. Additionally, the results point to historically rooted and socio-politically infused reasons for the apparent lack of co-operation between municipal bodies. These include tensions stemming from, amongst others, the disparate nature of resource allocations, tax bases and staff capacities between rural and urban municipalities that proliferated in the apartheid, which are yet to be overcome effectively.

9.2.3 Differential conceptualisations of climate variability and change

Building on Chapters 5 and 6, Chapter 7 addressed the third research objective (see Table 11) by exploring the differential perceptions and understandings of climate variability and change within the local case study sites. Evidently, local understandings are highly differentiated, within and between communities in close proximity and these differential understandings are shaped by multiple influences, such as education levels and language. Moreover, GEC/CC and associated risks are perceived subjectively and assessed according to cultural backgrounds, political positions, personal values, history and other influential variables.

The most fundamental contribution of the results from this chapter is the revelation of the significance of religious and cultural belief systems in shaping understandings and responses to climate variability and change. SA is home to a heterogeneous and culturally rich population. Individuals and communities interpret and respond to GEC/CC experiences and phenomena through their diverse *a priori* cultural lenses and frames of reference (Swidler, 1986). My findings reveal that expressed religious viewpoints can be divided into two broad categories: fatalistic and potentially proactive/precautionary. Fatalistic viewpoints may undermine adaptive capacities, whereas potentially proactive or precautionary viewpoints can support adaptive capacity. In addition to faith-based beliefs, cultural frames and symbols play a central role in shaping people's understandings of CC, particularly amongst many participants belonging to Zulu and Xhosa cultures, who attributed extreme events, changes in the weather and GEC/CC to supernatural forces, including divine mythical beings (e.g. the *nkanyamba* and *nkosozane*) and ancestors.

Despite being principal factors in shaping experiences of climate variability and extremes, my empirical investigations reveal that considerations of religious faith and cultural beliefs remain largely unaccounted for in the development of GEC/CC policy and measures at all governance scales. Religious and cultural leaders are also marginalised in mainstream GEC/CC debates (Moser, 2007). These contentions apply to the SA context and more broadly (Hulme, 2009).

9.2.4 Divergent experiences, responses and vulnerabilities to climate variability and change amongst households across the municipal landscapes

Chapter 8 addressed the fourth research objective (see Table 11) and extends analyses presented in Chapter 7 through investigating divergent experiences and responses to climate variability and change amongst participant households in my multiple study sites. Specific focus in this chapter was on understanding differential vulnerabilities and adaptive capacities of households and neighbourhoods in diverse municipal contexts, as well as the role of municipal − public relations in shaping these. Vulnerability is decidedly subjective, reflecting broad beliefs about the relationship between society and nature as well as power relations and inequalities within society (Oliver-Smith, 2004). However, through the lens of PE and the starting-point approach to social vulnerability, several key drivers of vulnerability to climate variability and change were identified.

Empirical analysis, focused particularly on experiences of extreme events, revealed highly differential vulnerabilities and adaptive capacities between households and neighbourhoods across diverse municipal contexts. The results do not point to a clear-cut distinction between rural and urban household vulnerabilities. Rather, disparities in vulnerability are distinct between low-to middle- and high-income neighbourhoods and between different ethnic groups. Key influences on vulnerability and adaptive capacities were identified, including physical location, access to formal and informal insurance cover, housing, vital infrastructure and basic services. Moreover, subsistence agriculture supports food security in many low-income rural and urban households in both municipal regions. Social networks and resources arose as important determinants of vulnerability and adaptive capacity, as did differential psychological impacts linked to exposure to climatic stress. The results also exemplify the dynamic nature of vulnerability and difficulty of isolating vulnerability drivers and multi-scalar stress bundles (Fragkias, 2007). Evidently, co-existent climatic and non-climatic stressors shape vulnerability to GEC.

Moreover, I have interpreted the prevalent household responses to climate variability and extremes as short-term coping strategies because principal focus was mostly on returning to 'normality', through insurance claims or once-off government support, without attempting to transcend the status quo or proactively adjust to changing circumstances (Munasinghe and Swart, 2005). Additionally, through an explicitly

geographical lens, the importance of spatialising livelihoods (after King, 2011) and vulnerability to GEC/CC was emphasised as being central to the SA context, where, as a consequence of centuries of spatial and social regulation, vulnerability distortions assume distinct spatial dimensions. Therefore, the complex spatial distribution of people and physical assets immensely complicates the development of adaptation measures in the context of temporally and spatially variable vulnerabilities.

Household- and neighbourhood-scale adaptive capacities are embedded within institutional frameworks and influenced by local governments' policies and actions (Adger et al, 2006). Findings from the various sites within ULM and eThekwini provide important insights into municipal − public relations and the political ecology of vulnerability to GEC/CC. Evidently, household vulnerability to flooding and other climatic events has been exacerbated by inadequate provision of basic services and local government failures to expand, maintain and adapt existing physical infrastructures. Crucially, however, major drivers of vulnerability are fundamentally rooted in inappropriate politically and economically motivated developments, where the inseparability of SES are disregarded and local social-cultural systems disregarded. As such, underlying drivers of household vulnerability are predominantly rooted in poor urban governance and inadequate planning, which local respondents expressed powerlessness to influence. Viewed through a PE lens, Chapter 8's results point to the importance of politicising the environment and decision-making through bringing political dynamics into focus, as well as the need for considering unequal power relations in shaping GEC/CC vulnerability landscapes.

The multi-scalar nature of GEC/CC governance requires that horizontal and vertical inter-governmental relations be considered, in conjunction with relations between government institutions and local stakeholders. Many factors shape the relationship between the state and society, and hence the development of joint adaptation initiatives, and therefore cannot be viewed in linear or dualistic terms. However, several prominent relational characteristics, which have significant implications for adaptation measures, emerged through empirical investigations.

This chapter also revealed the prevalence of mistrust and dissatisfaction towards government institutions across socio-economically and racially diverse households. The

majority of households expressed disgruntlement about local politicians and bureaucracies, with much mistrust stemming from widespread allegations over corruption, maladministration, inadequate maintenance of key infrastructure as well as powerlessness to shape environmental decision-making, mainly driven by powerful and elite actors. Therefore, the potential of SA's legislated co-operative and decentralised governance approaches as 'cultural resources' (after Heyd and Brooks, 2009) for supporting collaborative multi-scalar governance has not been realised in reality, in the context of GEC/CC and environmental decision-making more broadly.

Meaningful involvement and influence of grassroots actors is fundamental to multi-level governance and necessary to facilitate contextually appropriate local developments and GEC/CC adaptation policy and measures. Despite recent efforts at joint initiatives and the growing influence of local NGOs and CBOs (although still somewhat disparate) collaborative, networked governance is still weak in my case study and SA contexts more broadly. This situation hampers collaborative adaptation efforts. These points noted, public attitudes about responsibility for addressing GEC/CC also strongly influences the extent to which local people engage with GEC/CC issues.

Due to its multi-scalar and broad ranging nature, all societal actors across multiple levels have a role to play in mitigating and adapting to GEC/CC, irrespective of GHG contributions (Adger, 2003). However, empirical findings reveal that many of my informants do not necessarily share this viewpoint of *collective* responsibility.
Rather, addressing GEC/CC is often seen as beyond individual control and instead lying with government and supernatural forces. Thus, this implies that most households do not feel that any responsibility lies within their household or individual household members. Denial of individual and collective responsibility may have far-reaching consequences for adaptation. Despite potential for adaptive actions at household and neighbourhood scales, the empirical results indicate that many households, especially low-income marginalised households, are reliant on and expectant of assistance from local government in disaster situations and for taking adaptive actions. Furthermore, very few household or community scale anticipatory adaptation measures have been initiated.

To date, much of the government support that households depend on for coping with the adverse climatic events has been in the form of relief or once-off assistance after flooding and storm events and does not reduce underlying drivers of vulnerability, offer long-term adaptive solutions or sustained livelihoods support. Reliance on this type of support without taking long-term adaptive actions, such as rallying government over CC action and environmental justice issues, building flood protection measures, diversifying livelihoods or relocating from risky sites such as floodplains is unsustainable in the long-term and is maladaptive.

In addition, collaborative or multi-level adaptation efforts between households or communities and local government were not well recognised by households across socio-economic spectrums. I have argued that this emerging situation of reliance and blame shifting is a major constraint to self-motivated proactive or precautionary adaptive actions at household and community scales, thereby threatening increase in long-term vulnerability. The key point is that government must play a central role in addressing CC through policy, practice and structural transformation, yet there is a vital need for *concurrent* and concerted GEC/CC action at finer scales that concomitantly challenge inequitable decision-making and development paths, especially in relation to GEC adaptation concerns.

9.3 Main contributions and conclusions of thesis

There are several main conclusions of this research. First, in contrast to the formation of networks at the national and international scales, inter-municipal (and especially neighbouring municipal) collaboration over GEC/CC adaptation processes is much less well developed. Empirical evidence suggests that municipalities, specifically, the physically and economically adjoined contiguous municipalities investigated in this thesis, have markedly different GEC/CC adaptive capacities despite their close proximity. In addition to the fact that contiguous municipalities share some fundamental functions and problems, since environmental (e.g. river basins and wetlands), economic factors (e.g. transport and trade flows) and various cross-border developments are not always neatly contained within artificial municipal boundaries, these unequal capacities are a core justification for increased horizontal collaboration. These disparities will ultimately further entrench existing environmental and social injustices and affect local populations' adaptive capacities and the long-term effectiveness of cross-border

adaptation processes. My research has thus made an empirical contribution to debates on multi-level GEC/CC governance and suggests a sharper focus within these debates on nurturing horizontal collaboration at municipal scales. In turn, this can help address differential vulnerabilities at local household- and neighbourhood-scales. The bordering municipalities' complicated and divisive institutional arrangements, coupled with ineffective support mechanisms and frameworks from other government spheres can impede collaboration and co-operation.

GEC/CC impacts occur to varying extents in different contexts and cannot be addressed effectively at any single geographical scale or by one category of actor. In this thesis I have argued that effective collaboration across politico-administrative boundaries is essential. I have shown that effective cross-boundary adaptation is hampered by interlinked political, economic, cultural and developmental challenges that may be difficult to overcome. Despite significant barriers to collaboration, I have proposed that there are very substantial synergies between effective adaptation processes and optimally functioning relational dynamics between all tiers of government. Weak horizontal and vertical networking between government spheres as exemplified through empirical results from eThekwini and Ugu case studies creates a critical barrier to adaptation at all scales.

Inadequate reciprocal learning and exchange between similar and contrasting municipalities across the SA landscape represents an obstacle to the implementation and sustainability of GEC/CC adaptation initiatives. However, if recognised and addressed, such obstacles can be transformed into opportunities for adaptation. A possible catalyst for this is increased formal and informal networking between municipal and higher government sphere staff, as well as external stakeholders such as consultancy firms. Nonetheless, it appears that the tensions and trade offs between contrasting policy agendas, developmental and environmental agendas and political priorities between all government spheres will be difficult to overcome. Significantly, empirical results also reveal that divergent and dynamic worldviews, values, agendas and priorities between individual actors in government positions are significant concerns for developing collaborative GEC/CC adaptation ventures. As shown in Chapter 6, ineffectual regulatory frameworks and guidance for the formation of collaborative partners and

networks for GEC/CC adaptation poses an additional barrier to the development of networked relations.

At the local household- to neighbourhood-scales, vulnerabilities and adaptive capacities are evidently shaped by a number of interlinking factors, which are difficult to isolate. The empirical results also contribute centrally to PE theory and debates surrounding the starting point approach to vulnerability and adaptation where socio-cultural and political-economic factors have been theorised to influence vulnerability differentiation. Evidently, our *a priori* cultural lenses are significant influences on conceptualisations of environmental phenomena and in turn influence behavioural patterns and adaptation to GEC/CC. The application of PE as an analytical framework allows for the plurality of knowledges around the issue of GEC/CC to be accounted for, rather than exclusively powerful mainstream discourses. Any attempt to address adaptation needs to be sensitive to multiple worldviews and cultural and religious beliefs. This can be achieved only through meaningful participation and deliberative decision-making. Instead, my empirical results show that local citizens, especially the most vulnerable, have little influence on governance processes as well as inequitable macro policies and trends. Indeed, top-down and technocratic decision-making approaches persist under the broad neoliberal ecological modernization state rubric.

9.4 Implications for policy and practice

International negotiation frameworks such as the UNFCCC are important for awareness raising, driving adaptation at global and national scales and developing overarching policy frameworks. However, while it is important to account for cross-scalar interdependencies and influences from global to local levels, many adaptations are ultimately undertaken at local scales (Satterthwaite et al, 2009). While there is much scope for experience and knowledge sharing across disparate and diverse contexts, adaptation processes emerge differently in each locality. Barriers and facilitators to adaptation are influenced by context specific macro and micro historical and current influences. Therefore, drawing from adaptation 'blueprints' alone will be inappropriate; more needs to be known about how adaptation is played out in specific localities and adaptation measures need to be tailored to specific contexts.

Regarding the SA context, my empirical findings point to, amongst others, the importance of accounting for culturally informed and dualistic understandings and approaches to environment and development issues for the development of adaptation measures in order to ensure that these are not further entrenched. I have suggested the salience of promoting an ecological approach to environmental rights in SA, which encourages recognition of the mutuality of ecological and anthropocentric concerns for achieving environmental/social justice. This could help bridge the frequent tension between brown and green agenda issues as citizens start to recognise better their complementarity. Linked to this, the imperative of addressing GEC needs to be elevated politically within the SA context, coupled with clearer policy and institutional directives to support actions at all scales of government.

More broadly, this research has policy implications for promoting adaptation to GEC/CC that accounts explicitly for differential vulnerabilities, and their underpinning causes, between households and communities across disparate municipal landscapes. All government spheres have a major role to play in developing adaptation processes, however, reliance on government support needs to be avoided through supporting local level adaptive capacities. Local level adaptive capacities can be supported through various measures such as culturally and socially sensitive awareness campaigns, support for community-led initiatives such as crop diversification, community environmental monitoring, networking and so forth. Current government-led GEC/CC educational and other initiatives appear to follow predominantly the conventional information or public deficit model which assumes that the public has no or limited knowledge about environmental problems and needs to be informed by 'factual' knowledge (Wynne, 2005). A different approach is needed to take cognizance of multiple social and cultural factors affecting adaptive behaviour and responses to climate variability and change. Here, the rich anthropological and cultural studies literatures have much to contribute. Further, nurturing local adaptive capacities ultimately depends on appropriate macro level systems of development and resource use. Currently, the state appears to be emphasising individualisation of GEC/CC adaptation without adequate concurrent shifts in structural neoliberal pro-growth agendas and investments in inappropriate developments that ultimately undermine, rather then strengthen adaptive capacities.

In line with current international trends, particularly in developing contexts where pressing developmental needs often trump environmental concerns, mainstreaming of GEC/CC adaptation with development has been strongly promoted in emerging SA policy. This approach is important in many ways, especially since development efforts are likely to be undermined if they do not account for GEC/CC and assess likely effects on increasing or decreasing vulnerability (Simon, 2007; Parnell et al, 2007). However, my empirical results point to a number of caveats that require attention. Many aspects of current development paths appear to be maladaptive, inequitable and sometimes make people more vulnerable, as illustrated in the example of government led RSP, Ghandinagar and Thokoza housing on a known floodplain. Simply mainstreaming GEC/CC measures with existing development paths is thus unlikely to be effective in the long-term. As stated, mainstreaming will be ineffective if development trajectories inadvertently exacerbate vulnerability. Therefore, adaptation is not a panacea to current development problems, rather vulnerability reduction and sustainable development provide the basis for adaptation (Schipper, 2007). In this light, I argue that policy development could benefit from a focus on 'transformative adaptation' (after Pelling, 2011), which encourages transformation of existing development paths and revision of social contracts to help form just and sustainable adaptation measures.

I am not suggesting delaying GEC/CC action while development paths are transformed. On the contrary, both adaptation processes and development are long-term projects that require immediate attention, yet simply adding on GEC/CC action to current development trajectories will compromise both in the long-term. Beyond incremental change, policy and institutional structures need to be transformed to align with the intentions of adaptation processes. While there are a broad range of responses to GEC/CC, adaptation is imperative because it entails long-term continuous adjustments to transformed environments and human-environment relations which require different monitoring, resources, inclusiveness, planning time horizons and finances than many traditional and typical responses to climatic hazards. Adaptation should also not detract from, or be viewed as an alternative to, mitigation of GHGs (Munasinghe and Swart, 2005). Mitigation is an important complement to adaptation since, without mitigation, adaptation possibilities will be exceeded.

9.5 Further research and concluding comments

This study has offered important insights into an emerging policy and practice arena in the SA context. There is scope for much more theoretical and empirical work to develop the ideas and findings in this research and new avenues of inquiry. Had time and resources allowed, this study could have been extended to include a larger sample of government representatives, especially at higher government spheres to gain deeper understandings of governance dynamics in the context of GEC/CC. An important extension of this research would be to consider further what the catalysts for increased horizontal and vertical inter-government collaboration might be and how these can be nurtured. Further, this research has only touched on the role of non-state institutions such as NGOs and consultancy firms in shaping government responses and capacity to GEC/CC and much more needs to be known about these relations for effective adaptation processes to commence at all scales.

It will also be important to investigate comparatively relations between other bordering municipalities across the country to consider the extent to which my research findings apply more broadly and where notable differences lie. This is important for municipalities across the country to start to learn from each other's experiences. More also needs to be known about existing collaborations between municipalities (such as Cape Town and Durban) regarding motivations and catalysts that can be drawn from and built upon in developing further municipal networks.

Regarding the second layer of analysis, further studies could also benefit from a larger sample of households within specific study sites to gain a more representative understanding of the issues under investigation. Regarding the role of religious and cultural beliefs in shaping conceptualisation and responses to GEC/CC, future work could also investigate more fully the influence of specific religious affiliations or cultures and compare these. While this thesis reveals the centrality of religious and cultural beliefs for GEC/CC adaptation processes, there is still relatively little information on these issues, nor adequate consideration and research into these influences. This contention applies more broadly than the SA context, as scholars that have started to engage with these considerations have also recognised the burgeoning need for further research (e.g. O'Brien, 2009; Orlove et al, 2005; Schipper, 2009). Evidently, second-generation adaptation approaches offer an effective lens for

extending already relatively advanced understandings of the biophysical implications of climate variability and change to account for intricate socio-cultural and other dynamics that strongly influence vulnerability.

To further enrich findings of this thesis, it would be useful to re-examine the situation in the case study areas in the near future as municipalities extend their GEC/CC adaptation processes and to assess the extent to which these entail horizontal and vertical collaboration. It will also be interesting to assess the extent to which local communities start to develop and implement anticipatory adaptation measures as they become increasingly aware of GEC/CC risks and consider barriers and facilitators to these as they emerge. The influence of COP 17 in Durban in November-December 2011 on government and public perceptions and responses to GEC/CC is a further important avenue of inquiry.

In short, adaptation is still in its infancy, not only in SA, but also globally, with many obstacles remaining. While recognising these obstacles, I also hope to have emphasised some potentials for overcoming these and turning constraints into opportunities for change. At the beginning of this thesis I outlined my concern with highlighting the inherent injustices of the vast disparities in GEC/CC vulnerability within the SA context, my home country, and how these need to be at the forefront of adaptation concerns. I have witnessed many advances in GEC/CC action in the SA context throughout my research period. Nevertheless, adaptation processes are yet to be adequately prioritised and implemented, with an adequate focus on addressing the root causes of differential vulnerabilities. Until this situation changes, the aptness of singer songwriter Bob Dylan's (1964) words will continue to chime at the back of my mind, as they have since the outset of this research endeavour:

> Come gather 'round people, wherever you roam and admit that the waters around you have grown and accept it that soon you'll be drenched to the bone. If your time to you is worth savin' then you better start swimming, or you'll sink like a stone, for the times they are a-changin…….keep your eyes wide open, the chance won't come again (Bob Dylan, 1964)

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Appendix I: Key milestones of the South African national government's climate change response (1994-2011)

1994	SA DEAT established the National Climate Change Committee (NCCC) – multi-stakeholder forum for negotiating SA's cc response
1997	SA government ratified the UNFCCC
2002	CC gains momentum on SA political agenda as a result of World Summit on SD in Johannesburg attended by heads of state of over 180 countries
2002	Government acceded to Kyoto protocol (which came into force in 2005
2003	Conclusion of 'SA Country Studies' and 1990 and 1994 GHG inventories and submitted these in the Initial Communication to the UNFCCC secretariat
2005	'Climate Action Now' Conference and 'Midrand Plan of Action' outcome – conference reached unanimous agreement about the reality of CC and government confirmed that SA would accept responsibility to address CC and the need to encourage different economic sectors to address the challenge
2006	Cabinet mandated the Long-Term Mitigation Scenarios (LTMS) development process: a national process for developing scenarios of possible GHG emission futures
2007/8	LTMS results published in series of reports
2007	ANC Climate Change Resolution at the 52nd National Conference in Polokwane – government strongly recognised the need for immediate action and supported the need for a GHG emissions reduction target to be set.
2008	Cabinet approved key themes and strategies to guide the development of the National Climate Change Response Policy
2009	Climate Change Summit held in Midrand to initiate a consultative process to develop the SA Climate Change Response Strategy
2009	Copenhagen Accord and SA's commitments-SA national government announces at COP 15 that (premised on several conditions) "South Africa will undertake mitigation actions which will result in a deviation below the current emissions baseline of around 34% by 2020 and by around 42% by 2025" (The Presidency, 2009)
2010	National Climate Change Adaptation Policy Framework (to inform adaptation aspects of National Climate Change Response Green and White Papers
2010	Second National Communication (SNC) (final version due for release in 2011)
2010	National Climate Change Response Green Paper
2011	National Climate Change Response White Paper

Appendix II: Likely impacts of GEC/CC on key sectors and possible implications thereof for the eThekwini and Ugu regions

Sector	Likely impacts of GEC/CC	Examples of related effects and implications of such impacts
Health	Increased heat stress Increased vector borne diseases, Increased susceptibility to diseases, increased spread of disease and possible expansion of malaria zone Ozone-related respiratory illness Increased levels of atmospheric pollutants	Increased pressure on already overstretched health services, loss in overall productivity in Durban and ability of people to meet livelihood requirements Different vulnerability complexes affect different health outcomes e.g. heat stress, housing type (formal/informal settlement, materials used, ventilation), location of clinics, electricity provision
Water and Sanitation	Both quantity and quality of water will be adversely affected Increase in frequency and intensity of droughts and floods Increased salinity of water quality, degrading river water quality, threatened primary river ecosystems, Ability of existing infrastructure e.g. dams to store and capture water compromised	Periodic droughts - short term water shortages at local level Water availability for both industrial and domestic consumption expected to decrease (e.g. Mgeni Catchment water availability expected to decrease by 157.8 million cubic metres for period 2070-2100)
Biodiversity	Change in geographical distribution of plants and animals Decreased biodiversity and loss of green spaces such as wetlands	Increased surface runoff, increased erosion Loss of environmental goods and services will result in decreased opportunities for mitigation and adaptation
Agriculture/Food Security	Decrease in production yields due to changes in temperature and rainfall thus decreased food security Conversion and fragmentation of natural land Increased heat stress in livestock and wildfire Increased soil erosion	Increase in food prices, leading to decreased ability to meet nutritional needs-many knock on effects such as susceptibility to disease, decreased ability to perform regular activities-particularly threatening to those engaged in manual labour
Infrastructure	Infrastructure predominantly designed according to past climatic conditions Electricity and transport infrastructure are likely to be negatively impacted by increases in extreme weather events and sea level rise leading to interruptions in key services etc Stress on sewage systems	New guidelines are needed to ensure safety and quality of infrastructure to withstand new and increased weather extremes In addition to climate-proofing existing infrastructure, there is an urgent need to install infrastructure in those areas where it is lacking
Disaster management	Increased extreme events and other adverse climate related events raises -major challenges for disaster management which is currently predominantly reactive as opposed to proactive Increase in landslides, mudslides and flood damage and risk Increased fire danger	There is an increased need for early detection and early warning systems, colloboration between governmental departments and inter-departmental knowledge sharing and learning such as between climate change adaptation and disaster reduction functions. May require that people and infrastructure be relocated away from high risk areas. Increased support for community-led disaster management plans

		Improved post disaster recovery plans needed
Coastal, Stormwater and Catchment Management (Naturally sandy beaches)	Increased mean sea level will result in saltwater intrusion into groundwater and wetlands, thus further impacting already stressed water supplies and compromising the integrity of essential coastal ecosystem services Coastal vegetation and infrastructure likely to be damaged Likely increase in flooding and coastal erosion, combined with sea level rise in the long-term. Exploitation of coastal resources	Likely to put large portion of the coastal population at risk Major threats to livelihoods and vital infrastructure. Damage to private property, e.g. coastal homes as well as key municipal infrastructure
Strategic Planning and Economic Development	Economic and tourist areas particularly along the coast likely to be affected due to damage to infrastructure caused by extreme weather events Decreased expanse of sandy beach which attracts tourists Key Industries vulnerable to effects of climate change-e.g. sugarcane, low-lying South Durban Industrial basin and Central Durban vulnerable to sea level rise	Multitude of knock on effects with implications for all socio-economic groups

Sources: Sources: CSIR (2006), Ugu District IDP (2011), eThekwini Popular Climate Change Document (2007), Roberts (2008), Various Presentations from Durban Climate Change Summit (2009), Cartwright and Constable, 2009.

Appendix III: Coded list of interviews

Municipal Government Officials				
Interview Code	**Date of interview**	**Organisation**	**Department**	**Position**
A1 and A12 (follow up from A1)	02/9/08 and 12/11/11	eThekwini Municipality	Environmental Planning and Climate Protection Department (EPCPD)	Management
A2	22/04/10	eThekwini Municipality	Coastal Engineering, Stormwater and Catchment Management Coastal Policy Unit	Management
A3	1/6/09	eThekwini Municipality	EPCPD Climate Protection Branch	Senior
A4 and A11 (Joint interview)	8/10	eThekwini Municipality	EPCPD Climate Protection Branch	Management (A4) and Senior (A11)
A5	12/5/10	eThekwini Municipality	EPCPD Policy Implementation Branch	Management
A6	30/4/10	eThekwini Municipality	Development Planning Unit	Senior planner
A7	4/2/10	eThekwini Municipality	Municipal Institute of Learning (MILE) (previous employed in IMAGINE Durban)	Junior
A8 and A9 (Joint interview)	25/5/11	eThekwini Municipality	Disaster Management Unit	Management (A8) and Senior (A9)
A10	13/8/09	eThekwini Municipality	Imagine Durban Department	Junior
B1	18/11/09	Ugu District Municipality	Environmental Services	Management
B2	24/11/09	Umdoni Local Municipality	Environment, Parks and Waste Management	Management
B3	22/09/10	Umdoni Local Municipality	Environment, Parks and Waste Management	Management (Follow up from B2)
B4	01/09/10	Umdoni Local Municipality	Environment, Parks and Waste Management	Junior Assistant
B5	22/1/10	Ugu District Municipality	Disaster Management	Junior
B6	02/8/10	Ugu District Municipality	Environmental Services	Management (Follow up interview from B1)
B7	22/8/10	Ugu District Municipality	Planning	Junior
Non-governmental institutions Environmental Consultants				
C1 and C6	02/09/08 (C1, joint interview with A1)	Golder Associates	Durban branch	Senior
C2	09/11/10	SSI-DHV	Pinetown branch	Junior

		Engineers and Environmental Consultants		
C3	17/12/09 and 01/05/2010 follow up interview	ANON	Durban branch	Senior
C4	31/05/11	ANON	Durban branch	Junior
C5	22/01/10	A&E Associates	Umdoni Municipality (Based in Pennington)	Director
Political Organisations				
D1	07/04/10	Traditional Authority	Ngcolosi (near Inanda)	Traditional leader/Chief/*Nkosi*
D2	5/4/10	Kwamakhuta Youth League	Kwamakhutha	Youth leader
D3	24/5/11	Qadi Tribe	O'Brien	Representative/ spokesperson
D4	7/12/09	Local political leader	ANON	Party leader
D5	31/03/10	Traditional healer	Ngcolosi	n/a
Non-government institutions				
E1	04/2/10	Local High School	Scottburgh (Umdoni Local Municipality)	Teacher
E2	18/12/10	Ghandinagar Flood Victims Committee	Ghandinagar Township	Committee Member
E3	29/3/10	WESSA	Environmental Education	Environmental Education Officer
E4	29/3/10	WESSA	Environmental Education	Research Officer
E5	3/7/10	Riverside Park Ratepayers Association	Riverside Park, (Umdoni Local Municipality)	Committee Member
E6	5/12/09	SAI religious organisation	NA	Leader
E7	22/08/10	Church	NA	Pastor
Provincial Level				
F1	01/04/10	Department of Agriculture, Environmental Affairs & Rural Development (DEA&RD)	Environmental Assessment Department	Assistant Director
F2	24/5/11	Department of Agriculture, Environmental Affairs & Rural Development (DEA&RD)	Environmental Planning and Co-ordination Unit	Senior Manager
F6	29/04/10	WESSA	Environmental Assessment	Regional EIA Reviewer
Informal Informants				
G1	Various informal meetings/discussions and participation in numerous seminars	UKZN Centre for Civil Society	Civil society organisation	Various representatives
G2	Informal discussions on various occasions	SDCEA	Non-governmental organisation	Senior

G3	27/5/11	CSIR	Research organisation	Junior
G4	18/3/10	Isipingo Hotel	Bar/restaurant	Administrator
Interviewer				
HL	Hayley Leck			
SB	Sibongile			

Household interviews: Codes, location and numbers per location

Location	**Interview Code**	**Total no. of interviews per location**
Transient Settlement	I1, I2, I3	3
Park Rynie/Pennington	I4, I5, I6, I7, I8	5
Ghandinagar	I9, I10, I11, I12	4
Riverside Park	I13, I14, I15, I16	4
Kwamakhutha	I17, I18, I19, I20	4
Isipingo	I21, I22, I23	3
Amanzimtoti	I24, I25, I26, I27	4
Ngcolosi	I28, I29, I30, I31	4
Molweni	I32, I33, I34, I35	4
Kloof	I36, I37, I38, I39	4
Sezela Rural	I40, I41, I42, I43, I44, I45	6 Sum total: 45

Appendix IV: Interview Schedules

Some themes and questions explored with government and other key officials

Basic/general information

- What is your role in the organisation?
- What are your main job functions and responsibilities?
- What are some of the key challenges that you face in your job?
- Who do you interact with in performing your duties and at what level of political administration?

Awareness and understanding of global environmental change (GEC)/climate change (CC)

- Please explain what you understand by GEC/CC.
- Is GEC/CC a serious problem?
- Is there anything that concerns you most about the likely impacts of GEC/CC?
- Which sectors do you think will be most affected by GEC/CC? How?
- Are there any factors that can be addressed to enhance capacities to address GEC/CC at different government levels and community scales?

Views on institutional roles and relations for addressing GEC/CC

- What role do the different government spheres have to play in addressing GEC/CC?
- In your view, is GEC/CC and the need to adapt and mitigate against the likely consequences thereof a priority within eThekwini/Ugu District municipalities/other government spheres? Please explain.
- Do you think that eThekwini/Ugu/ULM municipality are well prepared for dealing with GEC/CC?
- In your opinion, what are the main challenges facing local governments with regards to dealing with the likely impacts of GEC/CC?
- Are there any specific GEC/CC related plans or actions that your institution/line function is putting in place? Please explain.
- Are there specific departmental funds allocated to addressing GEC/CC?
- What are your views on inter-departmental communication and collaboration within your institution?

Horizontal relations between municipalities

- Are you aware of any GEC/CC adaptation or any other GEC/CC related measures or strategies that Ugu/eThekwini municipality has implemented? If yes, please explain and express your views on these.
- From your experience, how would you describe the interaction between municipalities, for instance, with regards to collaboration over cross-boundary issues (e.g. shared infrastructure, coastal systems)?
- Is there evidence of past experience where neighbouring municipalities have engaged in joint efforts to address environmental or any other issues?
- Are there potential overlaps in responsibilities and skills between authorities and other representatives of different municipalities that could facilitate interaction?
- Are there any constraints to inter-municipal collaboration and the formation of inter-municipal partnerships? Please explain.
- What are your views on the role of inter-municipal collaboration and relations for decision-making and GEC/CC strategies and measures?

Vertical inter-governmental/multi-scale relations

- How would you describe the interaction and co-ordination between municipalities, the provincial sphere of government and the national government?
- Are there are any constraints to interaction and co-ordination between various government spheres?
- How do you view the importance of such multi-level or inter-governmental relationships for the success of GEC/CC adaptation and other strategies/emerging policies?
- What are your views on national/provincial/local government's GEC/CC plans/emerging policies and actions thus far? What implications do these have for your unit or organisation?
- How useful and relevant are relations with the private sector and other external networks that your institution may engage with? Please give details of particular activities or programmes that are particularly (-un) helpful.
- Are there any key challenges that need to be overcome in order for GEC/CC to be effectively addressed and planned for within eThekwini and more broadly at the provincial scale?

Local populations and GEC/CC

- What is the level of public awareness and understanding of GEC/CC?
- Is it a pressing concern among local communities?
- What role do local communities have to play in addressing GEC/CC?
- Are there actions that can be taken to reduce vulnerabilities to GEC/CC amongst local communities?
- What do you think are some of the key indicators of vulnerability to GEC/CC at the household level?

Policy- and environmental decision-making and public participation

- Do you think that local decision-making and policy-making processes have changed since 1994? In what way?
- What is the extent of public involvements in environmental and other decision-making processes?
- Are there any difficulties to achieving meaningful public involvement?

Development and GEC/CC

- What are the major development and environmental issues/pressures in the eThekwini/Ugu District municipal areas?
- Are there any obstacles to achieving development goals in the municipal area and more broadly in the provincial and South African context?
- Is GEC/CC addressed as part of the broader development agenda? Do you think it should be?
- Does GEC/CC need to be treated differently from other development agendas? If so, how?
- How, if at all, does GEC/CC and predicted impacts thereof affect the achievement of sustainable development?

Note on government and non-government interview questions

The above thematic interview schedule provides examples of themes and questions explored with government and non-government representatives, such as consultants.

While similar themes and several of the same questions were asked, each interview was tailored to individual's roles and the institution they represent and the sequence and type of questions asked unfolded according to the interview process (as explained in Chapter 4). For example, representatives of municipal disaster management departments were asked specific disaster related questions such as:
How do you understand the relationship between disaster risk reduction and GEC/CC adaptation? Further, individuals involved in policy-making were asked questions, for example, about their views on the effectiveness of policies and extent of implementation at various levels.

Non-government representatives were also asked similar thematic issues and questions to the above, but interviews were also tailored to specific roles and respondents were also asked about their views on relevant government sphere's functions, relations, performance and so forth.

Some themes and questions explored with household representatives

Introductory questions

- How long have you lived in this house for?
- What aspects do you enjoy and dislike about living here?
- What is your occupation?
- How many people live in the house?
- What are the major development and environmental issues/pressures in your local area?
- What are the main stresses experienced by your household and securing your livelihood?

Perceptions, understandings and attitudes about GEC/CC

- What is your understanding of GEC/CC?
- Is GEC/CC a serious problem?
- In what ways do you think your household might be affected by GEC/CC?
- What implications do you think GEC/CC might have for your local municipality?
- Do the possible implications of GEC/CC concern you are present?

Experiences of extreme weather events and perceptions of vulnerability to GEC/CC

- Has your household been affected by extreme weather events? If yes, what were the main problems that you experienced? How did you respond to these?
- Are there any local community support mechanisms that you draw on in times of stress, such as the onset of severe weather events?
- Did your household receive or draw on government or any other assistance in responding to this event(s)?
- Have you implemented any strategies or to prevent or reduce damage from extreme events?
- If yes, have you experienced any constraints to implementing such measures?
- Do you feel that your household is vulnerable to GEC/CC? In what way?
- What do you think are some of the key indicators of vulnerability to GEC/CC at the household level?

Views on GEC/CC actions and responsibilities

- Do you think that any actions can or should be taken to address GEC/CC? If so, who is responsible for these actions?
- What role do the different government spheres have to play in addressing GEC/CC?
- In your view, is GEC/CC and the need to adapt and mitigate against the likely consequences thereof a priority within eThekwini/Ugu District municipalities/other government spheres? Do you think it should be? Please explain.
- Do you know of any GEC/CC initiatives that the local municipality has initiated? If yes, please explain your views on these?
- Do you think that eThekwini/Ugu/ULM municipality are well prepared for dealing with GEC/CC?
- In your opinion, what are the main challenges facing local governments with regards to dealing with the likely impacts of GEC/CC?
- Are there actions that can be taken to reduce vulnerabilities to GEC/CC amongst local communities?
- Is GEC/CC a pressing concern within your community?

GEC/CC and development

- Do you think that GEC/CC should be addressed as part of broader development programs or agendas?
- How, if at all, does GEC/CC and predicted impacts thereof affect the achievement of sustainable development?

Public participation

- Have you or any members of your household participated in consultative processes regarding environmental and development decision-making in your area?
- If yes, do you feel that your views were adequately taken into account?
- Do you think that local decision- and policy-making processes have changed since 1994? In what way?
- Do you feel that any changes can or should be made to enhance the effectiveness of such processes?
- What are your views on local politics? Is politics an important part of your life?

Note on household interview protocol:

The above thematic interview protocol/schedule lists examples of the types of questions asked during interviews. However, interviewees were also asked specific clarification and follow-up questions from surveys (e.g. religious and cultural viewpoints) and specific questions in relation to topics that emerged during the interview (as explained in Chapter 4).

Appendix V: List of conferences and other events participated in during fieldwork

Date	**Event**
28 May 2009	'Resilient Cities' Durban Climate Change Summit
05 March2010	Mkomazi Land Use Planning Meeting
24 May 2010	Isipingo Shoreline Management Plan Stakeholder Meeting
01 and 02 June 2010	eThekwini Community Participation Conference
29 March 2010 14 April 2010 7 May 2010 18 May 2010	South Durban Climate Change Partnership Full day workshops Group meetings Group meetings
30 October 2009	Kwanaloga Roundtable discussion-pre-conference strategic meeting-eThekwini Municipality
8-10 March 2010	Kwanaloga Climate Change and Rural Development Conference
04-07 November 2009	UKZN Centre for Civil Society (CCS) International Symposium-Crises and the Commons: Durban debates on politics, economics and environment
10 December 2009	Ghandinagar Flood Victims Committee (FVC) Meeting
14 January 2010	Riverside Park Ratepayers Informal Meeting
24 October 2009	Climate Action Day-Public event at Botanical Gardens hosted by eThekwini to create climate change awareness
October 2009-August 2010	UKZN Centre for Civil Society (CCS) Public meetings and lectures

Appendix VI: Survey schedule

Research Survey

Introduction:

My name is Hayley Leck and I am a postgraduate student from the Department of Geography, Royal Holloway, University of London. This interview will allow me to collect data for my PhD research. I would like to ask you questions about your perceptions of the weather and climate and how these impact on your livelihood.

With your permission, the data derived from this survey will be referred to and analysed for research purposes. The information that you provide will be treated confidentially and your privacy will be upheld at all times with your personal data anonymised in the final report write up. Are you willing and able to spend some time with me/us to please answer these questions?

Name:	Location:
Surveyor:	Date:

1. Experiences of climate variability, extreme weather events and responses thereto

a. Have you noticed any changes in the climate over the past 10 years or longer?

Yes	No

b. If yes, please briefly explain:

_____

c. Have these changes had any effects on your household?

Yes	No

d. If yes, please explain briefly:

_____

_____

e. Has your household been affected by any extreme weather events over the past five years? (At current or previous place of residence)

Yes	No

f. If yes, please briefly explain:

_____

_____

g. If yes, how did you respond to such events?

_____

_____

h. In your opinion, what, if anything, can be done to help households and communities prepare to cope with extreme weather events?

_____

_____

i. Have you made any changes in order to prevent damage or to better cope with extreme weather events or any other climate related issues that have affected your household?

_____

_____

B. Local perceptions, attitudes and understandings of climate change/GEC

a. Have you heard about climate change (CC)?

☐ Yes ☐ No

b. If yes, please briefly explain what you understand by CC:

_____

_____

c. How serious is the problem of CC and its likely effects?

Very Serious	Somewhat Serious	Not Serious	Not sure

d. Is CC a threat to you and your family's livelihood?

Yes	No	Not Sure

e. What impacts do you think that CC might have on your household?

_____

_____

f. What, if anything, concerns you most about GEC/CC? Please explain.

_____

_____

g. What do you think makes households vulnerable to the impacts of CC and extreme weather events?

_____

_____

h. Do you feel that you and your household are vulnerable to extreme weather events and other CC impacts? (Please explain)

_____

_____

i. What do you think the main causes of CC/changes in the long-term weather are?

_____

_____

j. Is action required to deal with the impacts of CC?

Yes	No

k. If yes, who do you think is responsible for taking such action?

_____

l. What kinds of actions do you think should be taken?

_____

_____

C. Perspectives on government responses to GEC/CC

a. As far as you are aware, is the local government doing anything to act against CC?

Yes	No

b. In your opinion, are local government responses to CC satisfactory?

Yes	No

c. As far as you are aware, is the South African national government taking action against CC?

Yes	No

d. In your opinion, is the national government's response to CC satisfactory?

Yes	No

e. Do you think that CC should be a priority on the governmental agendas?

Yes	No

D. Development Concerns

a. Please list the main stresses/challenges that your household faces

1. _____

2. _____

3. _____

b. Please list the main environmental risks/challenges facing your local area?

1. _____

2. _____

3. _____

c. Do you feel that these challenges are being addressed? (Please explain)

_____

d. In your opinion, how, if at all, might CC or an increase in extreme weather events, affect development goals and projects?

_____

_____

e. Do you grow any of your own vegetables/fruit?

Yes	No

If yes, please list what types: _____

E. General/Demographics

a. How would you describe the sense of community/community feeling within your neighbourhood:

- Strong
- Relatively Strong
- Weak
- Non-existent

b. Age:

>20	20-29	30-39	40-49	50-59	60-69	>70

c. Gender:

Female	Male

d. Have members of the household invested in any forms of insurance/stokvel/community savings?

Yes	No

e. If yes, please list what types:

_____

f. Highest education qualification:

No Schooling	
Primary	
Secondary	
Tertiary: Diploma	
Tertiary: Degree	

g. How many people live in the household?

_____

h. How many members of the household are employed in formal waged labour?

_____

i. What other income earning activities are household members engaged in?

_____

j. How long have you lived in this area for?

_____

k. Are you an active member of any community organisations?

Yes	No

l. If so, which one(s)?

_____

m. Are there any additional comments that you would like to make:

_____

_____

Appendix VII: Timeline highlighting key milestones and phases of Durban's CC response

Year	Institutional marker
1994	Municipal environmental management function established, 'Environmental Management Department', with a core sustainable development mandate
	Durban developed affiliation with ICLEI
	Durban became first South African city to accept the Local Agenda 21 mandate as a corporate responsibility
	Establishment of Durban Metropolitan Open Space System (D'MOSS)
2000	Climate-related action initiated in Durban through ICLEI's international cities for climate protection campaign (CCP)
2002	Sustainable development mainstreamed through municipal IDP thus facilitating specialist environmental management focus within EMD: the planning and protection of the city's Biodiversity.
2004	Initiation of municipal climate protection programme (MCCP)
2006-to date	Climatic Future for Durban Report – based on vulnerability assessment of local impacts of climate change on the municipality and put forward possible responses (Phase 1 of MCCP)
	Headline Municipal Adaptation Strategy (Phase 2)
	Urban Integrated Assessment Framework (in progress)-tool for simulating and comparatively assessing strategic plans and policies in the context of climate change (Phase 3)
	Mainstreaming climate change considerations into municipal planning and development (Phase 4)
2006	*A Climatic Future for Durban* report published - a city-wide climate impact assessment presented to City Council
2007	Approval of climate protection branch within the EMD and attempts to mainstream climate change into all municipal departments
2008-to date	Implementation of Climate Smart Communities Pilot Project, including community adaptation plans (CAPs) Buffelsdraai Landfill Site Community Reforestation Project
2009	Municipal Adaptation Plans (MAPs) for health, water, disaster sectors created to facilitate adaptation actions into sector strategies and actions, address climate vulnerability and support Durban's broader development agenda.

November 2009	Council approved EMD name to change to reflect specialist focus: 'Environmental Planning and Climate Protection Department'
2010	Initial meeting to review progress on the implementation of the 3 key MAPs Durban's Mayor appointed as a member of the World Mayors Council on Climate Change and the Mayors Adaptation Forum Coastal cities network created with four other South African municipalities to develop an action plan that would facilitate in overcoming institutional barriers to adaptation action at the local level The Greening Durban 2010 Programme
2011	Durban Climate Change Partnership (DCCP) established and cost benefit analysis (CBA) of MAPS initiated City of Durban hosts COP 17

Sources: The official website of eThekwini Municipality (2011) (http://www.durban.gov.za/City_Services/development_planning_management/environmental_planning_climate_protection/Projects/Pages), Roberts 2008; 2010; Ford, 2009; Carmin et al, 2011

Appendix VIII: Newspaper articles

Mid South Coast Rising Sun, February 9-15, 2010 Social Page 9

They lend a hand

THE South Coast Community Care Centre has fed and clothed many poor people over the past few months.

From feeding 500 to 800 poor and needy people in the rural areas they now plan on building a care centre. "We want to build a care centre to house children. To establish a safe, loving environment for children that do not have homes. Each home will cater for six children and two parents," said Gert Veltman.

Gert said land is still being sought to build the centre. This is one of the many needs which they hope to fulfil through the South Coast Community Care Centre. A meeting with partners for the care centre has been scheduled for Tuesday, February 23.

Me and my dad

Big smile: *Dhimil and little Mihita Laila at the Scottburgh Flea Market on Saturday.*

Tea party

Friends: *Emmanuel Singaye, Haydn Henning, Claire Singaye and Jill Henning enjoy the get-together to raise funds for Khanya Hospice at The House of The Rising Sun, Park Rynie.*

Mid S.Coast Rising Sun 9-15 Feb 2010

Enviro issues delay work

MICKEY GOVENDER

MOVES by the Umdoni Municipality to resettle flood victims and to house the thousands of shack dwellers in the area have been thwarted once again.

The municipality overcame the hurdle of acquiring land at Farm iSonti and Windy Ridge but now it faces a further problem - "environmental issues" which will impact on the commencement of developing the area for displaced communities, according to a reliable source.

Apparently the housing development must first have a water waste treatment plant before any building operations can begin.

Initially it was thought that the sewer reticulation plant in Umzinto would cope with the added number of homes using the plant but this was found to be not feasible.

"But engineers are grappling with the problem and it will not be long before the matter is resolved," the source said.

They are said to be in consultation at the time of going to press.

The acquisition of farm Dumayo was also contentious but "negotiations" for acquisition were continuing. The municipality, in conjunction with the Department of Human Settlements (DOHS), was making good progress in the Malangeni area with 250 of the 1,000 houses scheduled to be built.

In the sector in rural development and rehabilitation, the municipality was believed to have commenced construction in rural flood-damaged areas.

The project was being handled by Mageba Projects, the source said.

On the question of relocation of 33 flood victims in Ghandinagar, the source said land acquisition was a problem at this stage.

Reunion for Sezela residents

Calling all ex-Residents of Sezela, Lower Sezela, Bazely, Lynton, Umdoni Park to "Get Back To Your Roots."

If 2000 Reunion was a success, this is expected to be greater. Don't miss out on a fun-filled and a 'Day to Remember'. Let's unite and re-live the past. Whatever your connection was with Sezela you are wanted back. Please register with your Local Committee for catering purposes. Any donations are welcome to cover costs. More interested people are required to join the Durban Steering Committee.

DURBAN AND SURROUNDING
Rigen Pillay- 084-398-3205
Teddy Marimuthu- 083-799-4152
Neville Peters- 082-467-1472
Raven Pillay- 084-750-3136

UMZINTO AND SURROUNDING
Pastor Strini- 078-032-3410
Mickey Govender- 082-940-1950
Rev.Scallen- 082-426-4009
Nelson- (039)974-3665
Sergie Marimuthu – 082-564-4226

MANAGEMENT COMMITTEE
Michael Marimuthu- 083-414-4935
Vis Pillay- 084-569-9114
Loga Naidoo – 084-403-3717
Rodney Pillay- 084-460-7220
Strini Mudrai – 084-575-1443

Banking Details
Sezela Reunion 2010
Standard Bank
Account number-054386837
Branch- Scottburgh Branch
Branch number 2572

Govender, M. 'Enviro issues delay work'. In *Mid South Coast Rising Sun*, February 9-15, 2010.

Duduza tornado 'like a snake'

2011-10-03 13:38

Johannesburg - The tornado that hit Duduza on the East Rand felt like a signal that the world was going to end, local residents said on Monday.

"It was like a snake with big eyes and its figure was made from the cloud," said Foster Mhlathi.

Another resident, Doctor Maseko, said: "I saw the heavens open and I thought that this is Armageddon."

Maseko's house, along with hundreds of others, were destroyed when a tornado descended on the township, near Nigel, on Sunday night.

An 8-year-old child died and over 160 people were injured.

"I was thrown out of my bed [when it came], and my electricity blew. Before I knew it, my roof had flown away and I was looking up at the sky. Lucky my daughter wasn't at home," said Maseko.

A woman sat on a couch surrounded by the ruins of her home on Monday, while she waited for instructions on what to do.

Christina Ngwenya said her grandchildren had to be taken to hospital, after the walls of her house collapsed on them, breaking their legs.

"This house is not built properly. There is no cement and no foundation. We don't know where to stay now." Many residents spent Sunday night at the Duduza multi-purpose centre.

"Everything is full there, and we don't know what to do. There is still so many kids here that are missing," Ngwenya said.

Maseko said he also had nowhere to stay.

"Everything is gone. My TV, my furniture. I didn't even go to work today. The ANC will take four years to rebuild this. I know it will never happen," he said.

The streets were littered with baby prams, broken television screens, furniture and corrugated iron roofing from houses hundreds of metres away.

Mhlathi said: "Now I don't know where to sleep and I don't have anything to eat. There are three people staying in my house and the rain is going to come back again today."

Source: News 24. 2011. 'Duduza tornado 'like a snake'. In *News 24,* 3 October 2011, (http://www.news24.com/SouthAfrica/News/Duduza-tornado-like-a-snake-20111003), Accessed October 2011.

Tornado-hit town to be declared disaster zone

2011-10-03 11:20

Johannesburg - The tornado-swept town of Duduza, near Nigel, south-east of Johannesburg will be declared a disaster area, Ekurhuleni Mayor Mondli Gungubele said on Monday. "Nature has disrupted the lives of our people. We are in the process of profiling each household and organising a team to co-ordinate the relief efforts," Gungubele said. An 8-year-old child died and over 160 people were injured when the storm tore through the township on Sunday night. Hundreds were left homeless and spent the night at a local multi-purpose centre. Gauteng health MEC Ntombi Mekgwe said six people were arrested for looting homes in the aftermath of the disaster. "This is the first time that something like this happened in the area. Everyone panicked, and no-one knew what was going on." Mekgwe said she was inspired by the actions of residents during the night. "I saw a young lady carrying a child that was not her own. The child was injured and she said she would take him to the hospital while his mother sorts out her home," she said. **Poorly-constructed houses** Gungubele said the cost of the damage still had to be assessed. DA MP Jack Bloom said an investigation had to be done into poor construction of RDP houses. "The houses were poorly constructed. The walls were not reinforced. And it's these things that have caused most of the injuries. "There was no cement between the bricks, and they fell apart... It's almost as if you can build a new house from the same bricks." Earlier on Sunday, a 9-year-old boy was killed and 42 people injured in a tornado in Ficksburg in the Free State. "[It] has killed one and left more than 100 houses destroyed," Netcare 911 spokesperson Chris Botha said. Hundreds of people were left homeless.

- SAPA

Source: http://www.news24.com/SouthAfrica/News/Tornado-hit-town-to-be-declared-disaster-zone-20111003#

Tenth flood yet still no help

>> Heartbreak and cynicism go hand in hand as council fails, yet again, to help those in need

SETON THOMPSON
>>ucnews1@feveronline.co.za

FOR the 10th time in 15 years, 61-year-old Kay Moodley and his 60-year-old wife Fay – both with serious medical histories – faced the hideous damage and fears that accompanied the invasion by flood waters of their humble home at Puffin Lane, Ghandinagar. It came hard on the heels of a 20-minute cloudburst on Sunday 27 November.

The loss of life and damage to property across much of the province, caused by last week's widespread flooding, was bad enough. The consequences are immeasurably greater when repeated ad infinitum to the same victims, all because those who could and should have protected them, failed to do so.

The Moodleys are accustomed to being shunted about by public authorities, having lived for many years in sub-economic housing.

In 1996, they were compelled to move, after 10 years, from their Riverside Park home, having been deemed too wealthy to qualify for residence there, and relocated to Ghandinagar.

Their new house, along with 35 others, was built in a 100-year flood zone, meaning that once in 100 years, a severe flood could reasonably be expected.

Only, the 100 year flood has happened three times in the past 15 years and less severe floods have occurred on another seven occasions.

The notorious June 2008 flood saw them up to their necks in water, terrified and hopeless.

When this became clear, Umdoni Municipality told residents they would be moved to a safer and more suitable area (See the Council's responses at the end of this article). That has never happened.

Instead, the municipality tried to protect them with storm water barricades but, as Sunday proved, failed dismally.

Unsupervised workmanship saw a large culvert dumped across the river, where it jammed trees and debris, creating a dam which poured through six houses.

A recently built channel delivered masses of water from the higher ground into their area, where it overflowed to supplement the flood already there and four sewage manholes in their garden flooded, delivering their contents to the mix.

A suggested solution doing the rounds is that local Minority Front councillor Shireen Bholla be replaced by an ANC substitute, in which case the authorities might then raise their game.

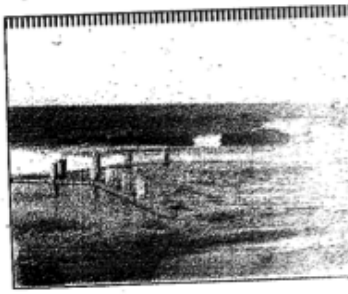
This was characterised as "a cheap shot" by an ANC councillor, but the cynical inactivity has ensured it is a bullseye.

The flood victims merely shrug their shoulders – they have little time for any politicians.

What Umdoni Municipality committed to:

"Land acquisition is in the process of being finalised." Krish Moodley, Umdoni Municipality, 19 October 2009.

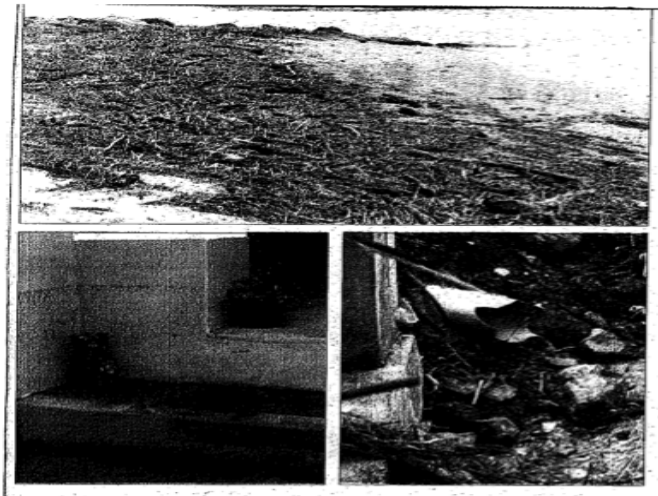
"Suitable sites for relocation have been identi-



TIDE UP >>

Pooling together

THE Umdoni Council has decided to review, in February, the annual restoration of the problematical tidal pools along its coastline. This year, a contractor would be appointed to dredge the Pennington and Mtwalume pools as close to the holiday season as possible.



Top: The floods that followed the heavy rain that struck widely throughout the Umdoni area on Sunday 27 November brought the Panyamboni River down in flood and distributed debris, mainly trees, branches and scrub, across the town's main beach.
Bottom left: The visible watermark shows the depth of the water during the flooding.
Bottom right: A broken and open sewer pipe feeds straight into the river.

fied and adjudication is under way and awaiting approval from Council. Committment of disaster management funds for the project has been finalised and affected families will be relocated to new properties which will be the same or better than those they presently occupy. Municipality has expedited all processes and procedures to complete the project timeously." Vassan Chetty, Umdoni Technical Services Manager, 17 December, 2009. "I am not aware of any delay through lack of funds but Council has a process and criteria (to be observed)." DD Naidoo, Municipal Manager Umdoni, 29 December 2010.

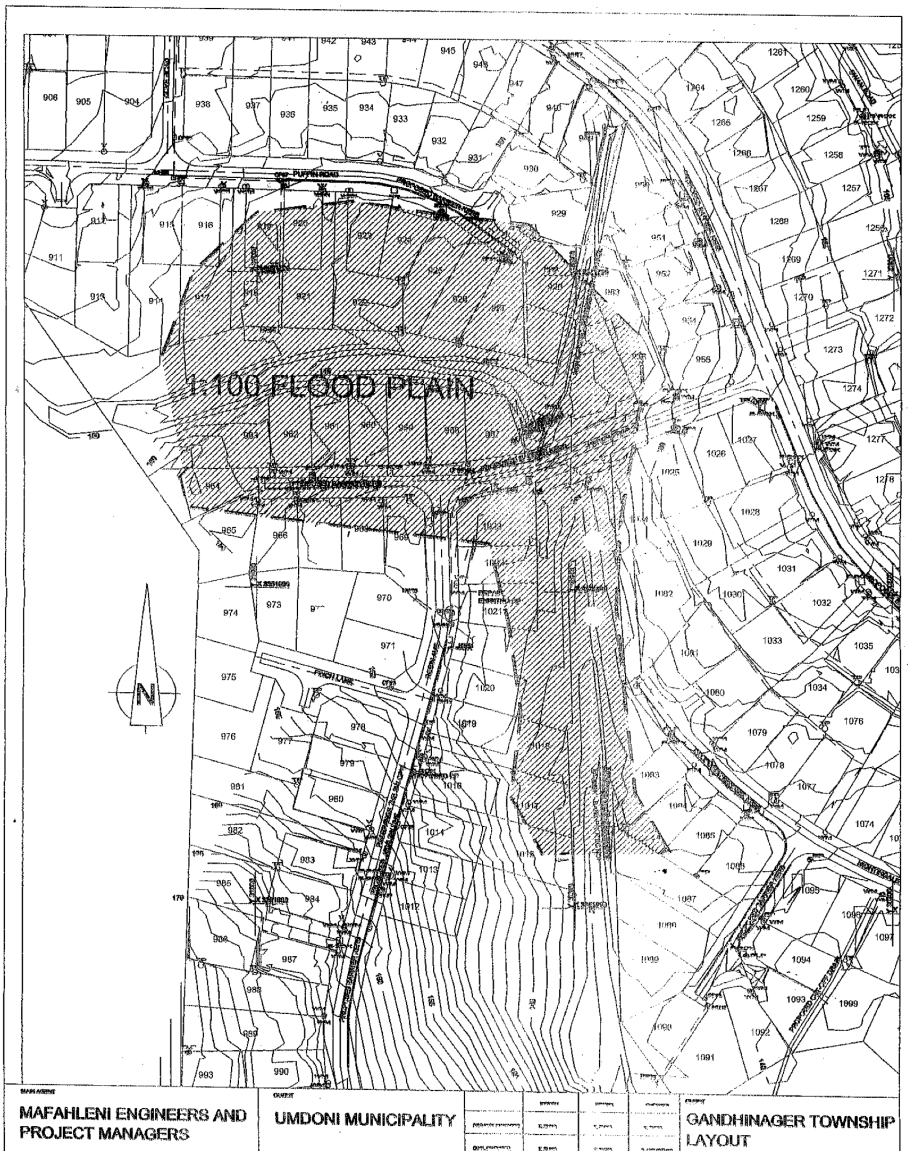
Umdoni acts to spend its grants

"IF you don't spend it, we'll take it back," sums up the trend in government policy regarding municipalities' failure to fully utilise grants for service delivery.

The issue was discussed at recent Umdoni Council meetings, and Speaker Sykes Naidoo told officials: "We will not accept funds going back; they must be invested in Umdoni." Municipal Manager DD Naidoo identified the core of the problem as "far too often, the consultant has received 70% of his fees before a spade even goes into the ground, thus reducing incentive to get on with the job". He also said delays in awarding contracts resulted from officials being overloaded and a lack of urgency by bid committees.

Source: Thompson, S. 2011. Tenth flood yet still no help – heartbreak and cynicism go hand in hand as council fails, yet again, to help those in need'. In *Upper Coast Fever*, 9 December 2011.

Appendix IX: Floodplain map



Source: Ghandinagar Flood Victims Committee (originally attained from Umdoni Municipality)