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A Comparison of Three South African Municipalities

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A Comparison of Three South African Municipalities

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Photo credit: A flooded area in Philippi, an informal settlement in Cape Town, South Africa.

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Executive summary

In the absence of a legally binding international agreement to curb greenhouse gas emissions, many cities and local authorities have begun preparing programmes of climate change adaptation in an attempt to manage existing and expected local climate risks. Rather than being a once-off, sector-specific technical fix, effective adaptation has come to be recognised as a process of socio-institutional change. This process includes iteratively assessing climate risks, selecting and implementing options to reduce climate risks, evaluating outcomes and re-assessing risks. While this recognition has enabled the climate change adaptation literature to find an easy resonance with broad notions of governance, the influence of local political and bureaucratic forces is not well-documented or understood, particularly in developing country contexts.

The research focused on the factors enabling and constraining climate change adaptation in three South African municipalities – Cape Town, Durban and Theewaterskloof – that are perceived to be local leaders in adapting to changing climate conditions. Qualitative data gathered from interviews, government documents and the available literature in the three case studies were compared, with an emphasis on the political, institutional and social factors shaping the initiation of climate adaptation at the municipal scale.

Cape Town and Durban are both large metropolitan municipalities where climate change adaptation is being championed from within the environment departments. Within the local governments of these municipalities, considerable progress has been made on assessing local climate risks and impacts and on developing plans listing various adaptation options. However, embedding these plans into municipal budgets and operations to progress implementation is proving difficult. Within Durban's local government, called eThekwini Municipality, there has been notable progress in getting high-level political support for climate adaptation and piloting a number of local adaptation projects, while in Cape Town the focus has been on opening up institutional spaces within which to mainstream climate adaptation into existing activities. Theewaterskloof, a much less populous, peri-urban municipality with a strong export agriculture economy, has no stand-alone climate change adaptation strategy, but has pursued climate change responses under a long-term vision and work programme of sustainable local economic development. This approach has local businesses centrally positioned in the design and implementation

of the programme, which has facilitated progress but marginalised labour groupings and poorer communities.

The notable absence of a national political agenda around climate change (and the natural environment more generally) in South Africa means there is very little political or fiscal support for local programmes. Whilst conspicuous in its absence, the lack of a mandate for political parties has its origins in what the research identifies as a knowledge deficit relating to the systemic nature of climate risks and popular misconceptions that climate change concerns are separate from and in competition with social and economic development goals. As a result, climate change adaptation remains, for the time being, in the realm of technical planning and management, largely confined to the efforts of municipal environmental and natural resource departments, where progress is contingent on the energy, efforts and agency of individuals.

The research yielded evidence that the prevailing political void around climate change in South Africa may be changing; that the efforts of local champions, in concert with rising global awareness of climate change and increasing impacts on the poor and the rich alike, are beginning to create a political opportunity for making climate change a central development issue, linked to patterns of consumption, employment and public services. This, in turn, may create the potential for mainstreaming climate adaptation into the core mandate, planning and budget allocations of South African municipalities.

Introduction

In the vacuum left by deferred progress in international agreements negotiated under the United Nations Framework Convention on Climate Change (UNFCCC), cities and local authorities are taking on increasing responsibility for climate change action. The rationale and process for cities to act on climate change is typically articulated in biophysical and economic terms. Much of the available academic and grey literature on cities and climate change refers to current and projected climate risks and impacts (often in broad terms with low spatial resolution), the opportunity to gain competitive advantage in emerging industries such as renewable energy, sustainable public transport, retrofitting the built environment with greener technologies (usually defined in terms of energy and water efficiency), and to a much lesser degree addressing factors driving climate vulnerability within cities (Bauer *et al.*, 2011; Hunt and Watkiss, 2011). The emerging discourse around responding to climate change in cities has supported the establishment of, and been promoted by, new networks such as ICLEI and the C40 Network, new indices such as Siemens' Green Cities Index[2], new publications such as the OECD's Cities and Climate Change (2010) and the World Bank's Eco2 Cities (Suzuki *et al.*, 2010), as well as a fresh climate change focus for existing publication series, such as UN-Habitat's Cities and Climate Change: Global Report on Human Settlement 2011. There is also a burgeoning academic literature on climate change and cities. However, the large majority of studies focus on climate mitigation and low carbon economic pathways, exploring cases in Europe, North America and Australasia.

Recognition of the role played by cities in both climate change mitigation and adaptation is to be welcomed. As Edward Glaeser (2011) recently pointed out, cities offer tremendous opportunities for progress towards increasing the quality of life. The rapidly evolving and expanding cities of the Global South, in particular, represent key loci of success or failure in meeting global climate change and development challenges (Parnell *et al.*, 2007). Without profound changes to the manner in which cities are built and maintained (or retrofitted), produce and consume energy and other resources and shape social relations and behaviour, progress is likely to be limited (Rosenweig *et al.*, 2011).

[2] http://www.siemens.com/entry/cc/en/greencityindex.htm

The climate change research bias towards biophysical and economic variables may be explained by the observation that "the governance framework of adaptation is still largely in the making" (Paavola, 2008, p. 652), but is problematic to the extent that it fails to appreciate the triggers and processes that define and influence changes in decision-making and action at the local scale (Chevallier, 2011; Leck *et al.*, 2011; Toteng, 2011; Carmin *et al.*, 2012). Relative to the plethora of research on climate risks, very little research has been done at the local scale on the critical role of political, social and cultural conditions in shaping the approach and relative success or failure of climate change adaptation, a void that is frequently overlooked by cross-city comparisons and attempts at peer learning between cities. For example, whilst Cape Town and its "twin city" of Aachen, Germany, may share the challenges created by anthropogenic changes in the global climate, they do so from very different points of departure. Cities differ in terms of how well adapted their residents and infrastructure are to the current range of climate conditions, and by way of the national policy, legislative and fiscal contexts in which they operate. Understanding the influence of local politics, legislative frameworks, social pressure and institutions is necessary to understand the difficulties and successes that local authorities experience in implementing international climate change prescripts and domestically formulated climate change policy.

Leck (2012), drawing on the work of Pelling (2011), points out that the complex and layered challenges presented by climate change require system-wide transformative thinking, planning and actions that challenge current assumptions and paradigms. Transformation is disruptive and can be threatening to vested interests and leadership incumbents. It is unsurprising then, that while very few local leaders anywhere in the world deny the need for climate change action, the most appropriate process, pace and extent of change is highly contested. Despite on-going references at the global scale to "action that is required by science", at the local scale insight into contested processes of change is poorly served by narrow scientific or economic perspectives. On the contrary, the types of change required to respond to climate change at the local scale are necessarily political, social and institutional (Mdluli and Vogel, 2010; Satterthwaite *et al.*, 2007; Granberg and Elander, 2007).

This study seeks to contribute to the emerging literature on the institutional[3] requirements for urban adaptation (Granberg and Elander, 2007; Adger *et al.*, 2009; Bulkeley, 2010; Ziervogel and Parnell, 2012; Carmin *et al.*, 2012; Ekstrom and Moser,

[3] The term institutions is applied in the broad sense, to include formal and informal legislation and the rules of the game.

2013) by identifying a number of political, social and institutional factors that have contributed to shaping the approach to climate change adaptation being taken in three South African municipalities (Figure 1): Cape Town, Durban[4] and Theewaterskloof. While South Africa has nationally been slow in providing a clear policy framework and set of fiscal instruments with which local governments can and should tackle climate change (as discussed in chapter 3), these three municipalities have shown leadership in addressing climate change risks and so provide useful and interesting cases for investigating the preconditions under which they have come to be pioneering the climate change adaptation agenda.

This study does not go as far as attempting to evaluate whether the adaptation strategies and actions evident in the three municipalities are likely to be successful in moderating harm or exploiting beneficial opportunities presented by climate change currently or in the future; it is too early for such an evaluation. Rather this study focuses on the conditions under which the process of adaptation has been conceived, negotiated and initiated within the different municipalities.

Figure 1 *Map of South Africa showing the location of the three case studies*

Source: 2013 AfriGIS (Pty) Ltd., Google, edited in Google Map Maker

[4] Durban is managed by the eThekwini Municipality; the boundaries of the city of Durban and the eThekwini Municipal Area are the same, therefore the place is referred to as Durban and the local government is referred to as eThekwini Municipality.

Durban and Cape Town are large metropolitan municipalities, internationally recognised for their progress in addressing issues of climate change (Ziervogel and Muikieber, 2007; Roberts, 2008; Roberts *et al.*, 2012, Cartwright *et al.*, 2012; Leck and Simon, 2012). Theewaterskloof is less acclaimed in the climate change field but has been developing a strong sustainability agenda that includes responding to climate risks. As a sparsely populated, peri-urban municipality that borders the City of Cape Town and contains Cape Town's key water catchment areas, Theewaterskloof provides a contrast to the Cape Town and Durban case studies in terms of:

1. its scale, *i.e.* the spatial extent of the municipality is larger than Cape Town and Durban but the population is much smaller, as is the number of employees and budget of the municipal government (see Table 1 below);
2. its predominantly agricultural economy;
3. its identity in relation to a large neighbouring metropolitan municipality;
4. and, as becomes apparent in this study, the approach that Theewaterskloof has adopted to addressing climate change challenges, which begins with systemic sustainability concerns and a "green economy" vision.

Table 1 *A comparison of the three case studies in terms of their size and municipal structure*

	Cape Town	Durban	Theewaterskloof
Area	2,440 km²	2,291 km²	3,232 km²
Population (2011)	3,740,026	3,442,361	108,79
Population growth rate (per annum)	2.57%	1.08%	1.54%
Unemployment rate	23.90%	30.20%	14.90%
Type of municipality	Category A metropolitan municipality	Category A metropolitan municipality	Category B local municipality within Overberg District Municipality
Composition of Council (parties with seats ≥5)	DA 135, ANC 73	ANC 126, DA 43, MF 11, NFP 10, IFP 9	DA 13, ANC 9
Municipal budget 2012/13	R30.2 billion	R31.8 billion	R360 million

Source: Local Government Handbook Survey 2012 (http://www.localgovernment.co.za)

Both Cape Town and Durban have stand-alone climate change adaptation plans, developed by their environment departments in consultation with other relevant departments (notably disaster management, health, water and sanitation, urban planning, roads and stormwater) that build on various risk and vulnerability assessments. This citywide adaptation planning began in the wake of, but largely independent from, early climate change mitigation efforts focused on greenhouse gas inventories, clean development mechanism (CDM) projects and energy efficiency programmes, driven through international funding agreements. By contrast, Theewaterskloof has never had a bespoke climate change adaptation plan or programme, but has addressed climate risks within a sustainable development framework titled "Vision 2030" and a resulting Green Economy Strategy. The Theewaterskloof effort was mobilised by relief funds provided by national government in response to the municipality's precarious fiscal condition at the time.

Methodologically, this study draws on recent precedents of qualitative comparative urban research (Ward, 2010; Robinson, 2011; Scott, 2012) and a process of interviews and document review. In this study, climate change adaptation is understood to be an iterative and ongoing process of recognising, assessing and responding to current and future climate risks and vulnerabilities (Smit and Wandel, 2006; O'Brien *et al.*, 2007; Moser and Ekstrom, 2010), recognising that the conduct and the practices of the state and state networks, play a significant role in shaping the nature and pace of this adaptation process (Bulkeley and Kern, 2006; Bulkeley *et al.*, 2009; Moser, 2009). Moser's (2009, p. 315) definition of governance – "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" – is applied to investigate the political, social and legislative influences on efforts to adapt to climate change at the city and municipal scale.

The report is structured as follows:

- Part 1 defines the process of adaptation as proposed in the literature.
- Part 2 describes the national legal, political and social context in which South African municipalities undertake climate change adaptation.
- Part 3 describes the research methodology.
- Part 4 presents the three case studies: the City of Cape Town, Durban and Theewaterskloof.
- Part 5 identifies emerging themes based on a comparative analysis between the case studies.
- a set of conclusions is finally provided.

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Part One

1. Conceptualising adaptation as a process

Moser and Ekstrom (2010, p. 22026), through their work on diagnosing barriers to local climate change adaptation, propose a definition of climate change adaptation that is particularly relevant to this study: "*Adaptation involves changes in socio-ecological systems in response to actual and expected impacts of climate change in the context of interacting non-climatic changes. Adaptation strategies and actions can range from short-term coping to longer-term, deeper transformations, aim to meet more than climate change goals alone, and may or may not succeed in moderating harm or exploiting beneficial opportunities*". This definition goes beyond the much cited version in the Intergovernmental Panel on Climate Change report (IPCC, 2007), highlighting the influence of both climatic and non-climatic pressures (*e.g.* economic, demographic, etc.) on the plans, activities and spending choices of actors. It foregrounds the variety of time horizons on which adaptation strategies and actions can be planned and implemented and does not predicate the definition of adaptation on success. In other words, something can be identified as an adaptation strategy and action even if it remains unproven whether the intervention or innovation will indeed reduce climate impacts or capitalise on new opportunities created by anthropogenic changes in the climate, as long as the intention and rationale is clear and explicitly refers to climate change as a (partial) driver.

Recognising that negative climate change impacts are one of a multitude of challenges confronting elected representatives and government officials highlights the difficulty inherent in distinguishing climate adaptation from any or all attempts at improving urban management and stimulating economic and social development. The definition does suggest, however, that for something to be considered climate change adaptation it must in some deliberate and demonstrable way be a departure from decision-making and operational practices that do not consider and account for long-term, human-induced instabilities in the climate system.

While this is not the first study to explore political and institutional influences on climate change adaptation, it should be acknowledged that the investigation of efforts to address climate change within municipalities is a relatively new and rapidly

evolving field. Existing research has focused mainly on the global north and predominantly on processes of climate mitigation. The emphasis in previous studies has been on how local policy responses have developed, focussing on the role of trans-national networks in the emergence of urban mitigation efforts, and why the implementation of mitigation efforts have failed to match policy commitments (Bulkeley, 2010). Many of these studies have adopted a governance perspective, particularly multi-level environmental governance, and provided an analysis of the roles and the linkages or relations between actors involved in processes of institutionalising climate change responses in policies and plans at the local, national and international levels (Bulkeley, 2000; Bulkeley and Kern, 2006; Granberg and Elander, 2007; Juhola, 2010; Nilsson *et al*., 2012; Leck and Simon, 2012).

Some studies specifically take institutions as a theoretical point of departure in considering the influences on municipal or urban responses to climate change. These studies identify factors that enable and constrain both policy making and operational implementation of mitigation and adaptation measures, particularly focussing on: the extent of municipal autonomy from higher levels of government; the problem of fit between the scale of the issues and that of municipal authority; the internal dynamics of municipal governments; and constraints on human, financial and information resources (as identified by Bulkeley, 2010 and addressed by Dodman and Satterthwaite, 2009). In a review of this literature, Bulkeley (2010) notes that research on the implications of urban climate change responses for socio-environmental justice and the reconfiguration of political authority, constitutes a critical gap (with the exception of early work by Rutland and Aylett, 2008). Carmin *et al*. (2012) engage institutional theory as a basis for differentiating between exogenous and endogenous forces that impact on climate adaptation initiatives in cities, identifying three endogenous factors as most influential in the cases of Durban and Quito: the efforts of champions; learning about local climate impacts; and leveraging adaptation to advance local development priorities.

From a different theoretical perspective, Pelling (2011) applies theories of resilience in complex systems, particularly notions of self-organisation and social learning, as well as socio-technical transitions thinking and various forms of critical social theory, to distinguish three levels of adaptation based on social and political change. Pelling's (2011) three level framework for examining climate adaptation processes and actions distinguishes between resilience, transition and finally transformation. While resilience is the first stage of building a municipality's capacity to adapt to climate change within the current status quo, transitional adaptation attempts to realise full rights while operating within existing political and governance systems.

Transformative adaptation focuses on addressing the underlying causes of vulnerability to climate change, requiring a fundamental shift in current economic systems, development approaches, and social relations, thereby contributing to greater social and environmental justice. According to Pelling (2011), transformation is achieved when adaptive acts consciously target reform in, or replacement of, the dominant political-cultural regime.

Despite the variety of theoretical positions, the literature on municipalities and climate change does not talk sufficiently about the tension between the politics and technicalities of adaptation choices and spending, the differences between municipalities in the same national context, and the ways in which fiscal conditions and funding arrangements shape adaptation efforts. Compared with research focussing on urban mitigation, very little research has been done on the emergence of adaptation efforts within municipalities, especially municipalities in the global south. And none that consider the combination of institutional, political, social and financial factors that play out in the complex arena of local government, where there are parallel administrative and political institutional dynamics at play, as undertaken in this study.

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Part Two

2. The national context for addressing climate change in South African cities and municipalities

What is frequently missed by the new city networks focused on climate change, facilitating cross-city comparisons and peer learning between cities, is the fundamental differences in the institutional (and more narrowly legal), political, social and cultural contexts in which cities seek to confront the shared challenge of climate change. Even within South Africa, the local authorities of Cape Town, eThekwini and Theewaterskloof seek to address their climate change challenges within markedly different biophysical and socio-institutional contexts, and with varied professional and fiscal capabilities at their disposal.

The purpose of this section is to outline the national context in which environment and development issues play out in South Africa. As powerful metropolitan municipalities such as Cape Town and eThekwini acquire legal, fiscal and professional capacity of their own, they are beginning to forge policies and programmes that are independent of (and not always perfectly aligned to) national positions. Amidst this process, the role of provincial government has become progressively less influential, although even weak provinces cannot be totally ignored as they hold key environmental and planning mandates and powers. In spite of environmental protection being a joint legislative responsibility of the national and provincial spheres of government, as laid out in South Africa's Constitution (Republic of South Africa, 1996), more and more environmental responsibility is being taken up at the local government level, particularly in the metropolitan municipalities, where problems of environmental degradation (*e.g.* loss of public amenities, health risks, storm damage, etc.) and benefits of environmental protection (notably tourism and job creation) manifest.

This section describes:

1. the legal and institutional context within which climate change is addressed at the local level in South Africa.
2. the evolving political context in South Africa and its influence over how climate change policy is being formulated, interpreted and applied.
3. the social and economic context in which South African municipalities are developing climate change adaptation policies and strategies.

2.1. The legal and institutional context of climate change responses in South Africa

South African law takes its lead from the Constitution of the Republic of South Africa (Act No. 108 of 1996) that was crafted in the wake of the first democratic elections in 1994. The Constitution established three spheres of government - national, provincial and local - and created the platform for the devolution of considerable power to local authorities. Section 152 of the Constitution describes the "Objects of Local Government" to include: (c) "promote social and economic development", and (d) "to promote a safe and healthy environment". The Constitution does not, however, provide an explicit mandate for local authorities to either manage the environment or to supply energy. On the contrary, schedule 4A of the Constitution lists the 'environment' and 'disaster management' as concurrent national and provincial competencies, leaving some local municipal officials complacent about the idea of taking on this challenging and costly responsibility, in spite of international bodies and civil society groups urging them to demonstrate proactivity and leadership in tackling climate change.

Those local municipalities that do pursue an environmental and climate change agenda are meant to do so in accordance with national and provincial legislation. In 1998, South Africa's National government passed the National Environmental Management Act (NEMA), an overarching piece of legislation that drew eclectically from international best practice. The Act (Republic of South Africa, 1998a) is conceptually progressive and sophisticated, and was driven through the legislative process by competent technocrats based on a combination of international principles and local natural sciences research. In the midst of major political flux within the ruling African National Congress (ANC) political party, NEMA was not, however, adequately integrated into political structures or processes, or into provincial and local government planning processes. In some instances it has served

to prevent certain proposed developments from receiving planning approval, but generally it has not given a strategic direction to the country's socio-economic development path. NEMA has not provided the ability to manage difficult trade-offs, even in communities that are heavily dependent on their natural resources for both economic growth and the services that functioning ecosystems provide, such as clean water and flood attenuation.

The post-apartheid government followed a principle-based and fast-tracked process in signing international agreements, with the intention of re-entering the international community after years of political and economic sanctions. South Africa is a signatory to both the UN Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. Under the UNFCCC, signatory countries are required to report on their greenhouse gas (GHG) emissions, vulnerability to climate impacts, ability to adapt, and steps being taken to address climate change. Coordinated by the Department of Environmental Affairs, South Africa prepared and submitted such National Communications to the UNFCCC in 2004 and in 2010. This reporting process has ensured data collection and analysis that reveals South Africa's current carbon intensity (*i.e.* cumulatively emitting high levels of greenhouse gases) and high levels of vulnerability to climate change (particularly in terms of water scarcity, species loss and aggravated poverty), as compared with other countries also reporting to the UNFCCC. As a developing country, South Africa is not obligated under the Kyoto Protocol to reduce national emissions; however, in 2009 the government stated a commitment to reduce national GHG emissions by 34% below 'business as usual' by 2020. A similar commitment is reiterated in the recent National Development Plan, launched in August 2012.

In October 2011, prior to hosting the UNFCCC's 17th Conference of Parties (COP17), South Africa's National Climate Change Response (NCCR) White Paper was released by national government, foregrounding the adaptation imperative prior to discussing mitigation. The White Paper further develops and refines the ideas put forward in the preceding National Climate Change Response Strategy and National Climate Change Response Green Paper, calling for climate-resilient development and formally placing climate change on the agendas of all government departments. The sectors targeted for particular attention in the NCCR are water, agriculture and forestry, health, biodiversity and human settlements, including a focus on cities. The White Paper highlights that more than 60% of South Africa's population live in urban areas, many of which face water shortages, high levels of air pollution that pose health threats, and the risk of regular flooding and fires. While referring to 'the environment' being listed in the Constitution as a concurrent function between

national and provincial government, the White Paper explicitly recognises the crucial role that local government plays in building climate resilience through: planning human settlements and urban development; the provision of municipal infrastructure and services; water and energy demand management; and local disaster response, amongst others. However, the Paper also goes on to acknowledge that the mandate for local government to take on various climate change related issues is not always clear. The White Paper calls for a critical review of the policy and legislation relating to local government functions and powers with respect to climate change. It argues for an appraisal of the fiscal mechanisms to support local government capital and operating expenditures and the need to incentivise municipal adaptation and mitigation, to be led by the Department of Cooperative Governance and Traditional Affairs and the National Treasury respectively.

Almost in parallel with the NCCR White Paper, in November 2011, the government approved the National Strategy for Sustainable Development (NSSD 1) that aims to balance environmental protection, social equity and economic efficiency goals in making development decisions. One of the five strategic objectives identified in the NSSD 1 is to respond effectively to climate change, thereby further strengthening the directives laid out in the NCCR White Paper. The NCCR White Paper and the NSSD 1 are relatively recent and so it remains to be seen how they might be linked up with ongoing local government activities to carry forward the climate change agenda and meet the objectives laid out in these national policy documents.

An Inter-governmental Committee on Climate Change (IGCCC) has been established, under the leadership of the Department of Environmental Affairs, in an effort to promote inter-sectoral and multilevel coordination (*i.e.* cooperative governance) and find ways to mainstream climate change into policy and strategy across government. The IGCCC brings together the relevant national and provincial departments and organised local government, represented by the South African Local Government Association (SALGA). However, SALGA currently has very limited capacity to act as an intermediary between local and national government, with climate change as only one of many items on their already stretched agenda.

One important but indirect influence on South Africa's climate change adaptation and mitigation efforts has been the absence of an encompassing or clearly articulated economic vision during the first two decades of South Africa's democracy. This is despite successive attempts to do so via the Reconstruction and Development Programme (RDP), the Growth, Employment and Redistribution (GEAR) strategy, the Accelerated and Shared Growth Initiative for South Africa

(AsgiSA) and, most recently, the New Growth Path (NGP) framework and National Development Plan (NDP). To the extent that climate change adaptation is informed by national socio-economic priorities, this absence of a vision partly explains the variety of processes adopted by different municipalities. The factions that constitute the national economy promote very different notions of the role of markets and the state, ideas of job creation, centralisation and decentralisation and indeed the role and importance of the environment in society and the economy. In trying to draw inference from this heterogeneous approach to economic progress, it is reasonably clear that, despite a strong environmental lobby and internationally acclaimed environmental legislation, the sentiment contained in many national government documents is that the environment is a luxury good, expropriated from the poor and protected for the rich, that will be attended to once the country has achieved a sufficient level of development from exploiting its mining and industrial potential. Given this view of the environment, it is unsurprising that climate change has struggled to attract political attention in South Africa. Instead, South Africa's early climate change focus was driven by ecologists and conservationists, especially within the South African National Botanical Institute (SANBI). It was only in 2005 when rolling black-outs forced the country to focus on energy security that public discourse developed around the links between energy generation and human well-being, and only subsequent to that, that climate change mitigation and by extension adaptation began to enter the country's development discourse. It is within the past six or seven years, in spite of a generally unsupportive national policy environment, that some officials within local municipalities have begun developing climate adaptation (as well as mitigation) positions and strategies, responding to local problems (such as damage to coastal infrastructure, biodiversity loss, flood impacts and water shortages) and linking to international policy debates. Given the lack of national guidelines and financing mechanisms on which municipalities might draw to address climate change locally, it is no surprise that the institutional configuration and content of the municipal climate adaptation programmes are markedly different.

In considering South African municipalities' legal obligation and opportunity to tackle climate change, De Visser (2012, p. 137) suggests that there "is scope for a more robust approach on the part of the City with respect to climate change activities". He distinguishes between the responsibility for mitigation, which he describes as an "environmental" responsibility and therefore not within the remit of local government, and adaptation as a matter of "social security" that does not hinge on an environmental mandate. De Visser (2012, p. 132) also notes that, "when the City amends its land use planning policies so as to adapt to climate change (by, for

example, prescribing certain types of land use close to coastal areas or ensuring densification) it does not need to point to a specific environmental mandate in order for it to be permitted to do so". One might argue that the distinction between 'environmental' and 'social security' is not as clear as De Visser imagines, arguing that unchecked emissions have their origins in social systems and markets that transcend municipal boundaries, and pose human security threats in their own rights. Certainly it has become clear that climate change is not easily governed from within municipal boundaries and neither the problem, nor many of the potential 'solutions', align with the conventional separation of powers between spheres of government (Bulkeley and Betsill, 2003).

Municipalities in South Africa have a Constitutional obligation (defined as a 'right') to govern, which in South African legal parlance is defined as "to conduct the policy and affairs" within a given jurisdiction and to "constitute a rule, standard, or principle" (South African Concise Oxford Dictionary 1990, in De Visser, 2012). This obligation clearly involves more than simple compliance with and implementation of national and provincial laws, policies and programmes. Effective governance at the city or municipal scale might easily be construed as including an assessment of trends, both locally and globally, and demonstrating a measure of 'initiative' (such as climate change adaptation) so as to avoid risks and support locally-specific needs and priorities. The problem for South African local authorities, however, is to demonstrate this governance initiative without assuming control of a mandate that expressly belongs to another sphere of government and to secure financing for related activities, when the fiscal allocation is tied to the mandate and thereby made to the national and provincial agencies.

A further defining influence on South African local authorities' ability to engage in climate change responses involves the legislation pertaining to public-private partnerships. While partnerships with outside agencies were clearly intended to be available in support of municipal service delivery (De Visser, 2012), these partnerships are regulated by a raft of legislation that, unwittingly, makes them untenable in meeting particular needs (Steytler, 2008). The Local Government: Municipal Systems Act No. 32 of 2000, the Local Government: Municipal Finance Management Act No. 56 of 2003 (MFMA) and the Local Government: Municipal Public–Private Partnership Regulations GNR 309 of 2005 (PPP Regulations) require municipalities to first consider internal options before being permitted to consider external options. South Africa's MFMA (Section 33) limits the period over which partnerships may span to three years, in all but exceptional circumstances. The three-year rule creates a significant barrier to undertaking climate change

adaptation and mitigation through partnerships, because projects such as the restoration of ecosystems, the maintenance of ecological assets, long-term monitoring and the production of renewable energy (for example using methane from landfill sites) require sustained working relations well beyond three years and only yield returns on investment over a long period of time.

However, as this study shows, undaunted by the legal complexity, faced with increasingly severe local climate impacts, encouraged by international precedents, and threatened by the economic consequences of a carbon intensive economy and unreliable supplies of electricity from the state-owned utility, some South African cities have made various attempts at putting climate change on the municipal agenda. South African municipalities are exploring their options within the context of a progressive Constitution that is relatively new and still subject to active testing and interpretation. Whilst for some time it was assumed that local authorities had very little environmental mandate relative to national and provincial government, and most municipalities were too pre-occupied with taking responsibility for the new obligations thrust upon them to challenge this assumption (Koch *et al.*, 2007), it is becoming clear that there are means by which willing municipalities may take on greater responsibility for their local environment, including mitigating and adapting to climate change.

While the climate change adaptation literature has tended to focus on technical, legal and financial constraints, the reality in South Africa is that emerging - and at times experimental - municipal programmes of adaptation are also influenced by political (including party-political) considerations. Understanding the political context in South Africa is important in understanding the manner in which local municipalities confront climate change and the extent to which adaptation efforts are mainstreamed across the workings of the municipal administration and the local council.

2.2. The political context of climate change adaptation in South Africa

It would be reasonable to assume that a study such as this one, comparing the realisation of the climate change agenda in different municipalities, would have as one of its central questions how a new political agenda is differentially embedded in practice. However, in the South African context, this tracing of the political commitment to climate change at the city or municipal scale and the institutional

practices of climate change reform cannot be separated. The reason for this is that there is no clear distinction between the politics of the leading parties and the workings of the state. This is as true of the African National Congress (ANC), the ruling party nationally, in the Province of KwaZulu-Natal and the eThekwini Municipality, as it is of the Democratic Alliance (DA), the main opposition party nationally, which is the ruling party in the Western Cape province and the City of Cape Town and Theewaterskloof municipalities. The close relationship between political parties and government and the absence of clear party political policy committees, or the kinds of lobbying and think tank structures that are common in Western Europe or North America, make the drivers of the policy landscape in South Africa somewhat opaque. The precise role of party politics at the city scale is under-researched and poorly understood (Low, 2007). Against this background, it is imperative to set out a brief description of how we understand new political directions or fresh political priorities (including new environmental concerns of climate change, food security, biodiversity or a push for a different social agenda, for example through a basic income grant) are taken on by politicians in the South African local government context.

Informal and confidential interviews with advisors to Ministries, party officials and senior officials in national line departments and the Presidency, members of the South African Cities Network and the National Planning Commission, confirmed that there is no comprehensive or independent political party machinery devising policy positions on substantive matters like climate change that could then move from the party to government (or into the opposition) to effect institutional reforms. Instead, a range of ad hoc mechanisms were suggested as being the best means to influence the direction of government on climate change, or any other issue. These are set out below.

In the immediate lead up to and aftermath of the 1994 transition there was a very active policy dialogue that debated major policy shifts needed in the new democratic context and, in some instances, resulted in coherent institutional forums. Housing, education, local government and employment each evolved organisations to host policy debate (Cameron, 1999; Rust and Rubenstein, 1996). Most often these were multi-party structures that brought key stakeholders together to forge a consensus on the way forward on important issues. The National Economic Development and Labour Council (Nedlac), a vehicle by which government, labour unions, business and community organisations negotiate and seek cooperative solutions to economic, labour and development issues, is a legacy of that time. Possibly because engagements in these various and diverse bodies and processes

were so demanding, the political parties did not themselves develop systematic independent policy capacity. There was also no clear source of funding within parties to create policy capacity beyond volunteers.

Today, there are a few active policy clusters within the ANC (*e.g.* on the economy and, post the energy crisis of 2008, a cluster was established to work on energy). These are largely ad hoc structures and are activated on an informal and voluntary basis. There is no ANC (or DA) party political structure dedicated to issues of environment or the environment-development nexus or sustainable development. There is, in other words, no formal party position on issues like climate mitigation or climate adaptation. Even the recent four-yearly ANC party conference, where new policy positions were aired, totally ignored climate change as a development concern. There is no official barrier to the creation of new policy clusters in the ANC, but nobody interviewed was aware of a move to do this on the issue of climate change. Given this situation, it would be fair to conclude that there is no party political driver of a climate change agenda, nor is there any party politically-constructed position on the relative importance of mitigation versus adaptation, or of the relative importance of expenditure on climate change risk management versus short-term-oriented infrastructure network expansion or job creation. There is no reason a political party might not adopt a formal position on an issue like climate change. However, the only mechanism for putting a position to the ANC is to go through ANC branches and these local branches, which then have provincial and finally national representation, are not set up to debate policy priorities and policy options on substantive issues. It is unclear whether the branch structure has ever been used to directly influence or change any sectoral policy adopted by government. Those interviewed were amused by the idea that climate change might find a champion in the branches, which tend to be preoccupied with leadership elections and party lists for political appointments.

In interview statements that reveal the overlap between political parties and the structures of state in South Africa, all indications were that the most effective way to influence and change policy direction was to work directly with government. Here there are two options when working with the political structures of government: the parliamentary portfolio committees, which are notoriously impenetrable and difficult to access, or the relevant Ministry. One problem in going through the national Ministries on a complex, multi-sectoral issue like climate change, where interventions will range from land use planning to energy policy, is that it is unclear which Ministry is the most relevant or suitable one to conceptualise the full extent of the problem and drive a set of policy responses.

As in many other counties, it is the Department for Environmental Affairs, under the Minister of Water and Environmental Affairs, where South African national climate policy is hosted. This positioning is largely because the problem of anthropogenic climate change was first identified and articulated by the environmental science community and efforts to reframe climate change from primarily an environmental concern to one of social and economic development have been of limited success. The Ministry and Department of Environmental Affairs has gained a reputation for being highly centralist and anti-metropolitan to the point of national government being seen as hindering, rather than facilitating or encouraging, local climate adaptation efforts in South African cities (Ziervogel and Parnell, 2012). Accessing the Minister is not easy, even for the politically well-connected. It was noted that externally driven international processes that demand national engagement with international agreements, such as those of the United Nations Framework Convention on Climate Change, can increase the take up of new agendas such as climate change, but only to a limited extent if they do not resonate with domestic political priorities. At the local scale the degree to which municipal managers, mayors and councillors are linked into global agendas and international engagements is also a critical factor in garnering support for the climate change agenda. This is where trans-national municipal networks, such as ICLEI, have played a critical role in furthering the climate change agenda.

Outside of the political parties and the formal elected political structures of government, opportunities to shape policy agendas also exist within the administrative structures of government. As this paper shows, this is in fact the key route that those locally concerned with climate change have pursued. This is not to suggest that engagements with and between bureaucrats are merely technical, uncoupled from political priorities. It should be noted that both the ANC and the DA have followed a pattern of appointing (and firing) top officials to ensure administrative support for their political agendas. Although the DA protests against the ANC's overt practice of cadre appointments, it too has followed the pattern of removing and installing staff sympathetic to its agenda in the City and Province administrations once elected. While not all appointments in the municipalities are directly sanctioned by parties, more junior positions have to work not only with their overt political counterparts who are elected, but they also have to work within the parameters set by senior staff, who are politically sanctioned. Sometimes these parameters are broad and enabling, other times they are conservative and constrain technical professionals in the municipal administration from innovating in response to new and emerging needs. Working with political leadership to ensure flexibility

and space within the municipal apparatus to experiment and innovate can be done in many ways: deploying people who take climate change issues seriously; securing the support of politically connected officials to allow space to work creatively on climate reforms within existing city processes and budgets; or by commanding new and uncommitted city resources for climate work.

This account highlights that influence on (climate change) policy direction is indirectly, not directly, realised though political parties. It also suggests that officials, technocrats and funders are more influential than might be imagined. Climate action at the municipal scale requires both political and official endorsement, and access to new funds. Implementation of climate action by municipalities is not simply the technical realisation of a political vision conceived in some other locale. In practice, the urban climate change agenda is being built 'from the bottom up'. It is therefore critical to understand local institutional imperatives, only some of which are determined by international and national protocols, while many others are shaped by local economic, social and biophysical conditions in and around the municipality.

2.3. The social context of climate change adaptation in South Africa

South Africa is one of the most unequal countries in the world and faces, by some measures, a widening gap of inequality (Seeking and Nattrass, 2005; Pieterse, 2010). Government at all levels (national, provincial and local) has encountered the difficulty of pursuing simultaneous economic growth and redistribution / poverty alleviation agendas. Inequality is manifest in, and further entrenched by, a distinctive and enduring spatial form. The geography of apartheid, with its system of racial segregation across physical as well as social and economic spaces, is still evident in most South African municipalities, despite continuing efforts by the post-apartheid state to address these inequalities (Leibbrandt *et al.*, 2010; Sutherland and Lewis, 2012). There is also some evidence of new spatial and social divisions in South African cities, with new patterns of vulnerability emerging alongside on-going urban expansion (Borraine *et al.*, 2006). While levels of non-monetary well-being, which includes access to potable water, sanitation, electricity and housing, have improved across most parts of the country since 1994, even accounting for substantial population growth, access to these services and the quality of these services, remains largely differentiated along pre-existing fault-lines of inequality (South African Institute of Race Relations, 2012[5]). This leaves many living in poor quality,

[5] See South African Institute of Race Relations (2012) p. 596 for a summary comparison of living condition changes for 1995 and 2011.

low-cost housing and informal shelters, on marginal land, poorly skilled and far from job opportunities, with minimal household incomes and limited access to transport, nutritious food and health services.

Figure 2 *Two faces of Cape Town, one formally constituted, well serviced and regulated, the other informal and poorly serviced by both the public and private sectors*

Photo credit: Sean Wilson 2009

The economic, social and spatial inequality evident in South African municipalities translates into differential vulnerability to climate conditions and extreme weather events, and is the context within which climate change adaptation takes place, adding a social justice dimension to climate risk management. These adaptation programmes include comprehensive municipal initiatives, as well as particular projects that focus on neighbourhoods or zones within the city, each with their own specific socio-economic and environmental characteristics. Climate change adaptation programmes by definition must be tailored and responsive to the specific local socio-economic, environmental, policy and planning context within which they are situated. In an effort to redress social injustices, efforts are underway in some municipalities to make climate change adaptation part of the wider development agenda, through initiatives such as food gardening, alien plant clearing, and other job-creating adaptation projects that are established to meet immediate development objectives (*e.g.* increased employment) in a way that simultaneously reduces people's vulnerability to climate change impacts.

South Africa's particular history and ongoing struggle for urban reconstruction and poverty alleviation has a number of implications for city-scale processes of climate adaptation. These are outlined below.

2.3.1. Informs perceptions and conceptual framing

Disparate socio-economic conditions that are typical of all cities, but are especially marked in South Africa, produce very different perceptions of public and private priorities, risks and opportunities. In conjunction with South Africa's cultural diversity, this makes the formulation and implementation of policy, including climate change policy, difficult. It is simply not possible to devise a policy or programme that satisfies the full spectrum of needs and expectations, either locally or nationally. Instead policy formulation invariably involves extensive trade-offs and high levels of contestation.

At the conceptual level, this is evident in perceptions of the environment itself. For many, the environment is a luxury good, a place that affluent people visit to view protected fauna and flora. In this view, the environment is seen as a distraction from, if not a barrier to, addressing housing shortages, job creation and other pressing development needs. This is a view that was reinforced by apartheid planning. The apartheid government deliberately protected areas of natural beauty and high biodiversity for the exclusive use of the 'white' racial grouping, forcibly removing indigenous resident communities from such areas; and saw areas in which so-called 'black' people were forced to settle as spaces that could absorb a wide range of environmental hazards (Cock and Koch, 1991). There is a hangover of this thinking still evident, but even more so there is a reaction or counter-position to such thinking and planning evident amongst many constituencies. On the one hand, it manifests as a protect-and-preserve narrative of keeping people out of nature/natural areas (especially when threatened species are now under added stress from changing climate conditions). On the other hand, it has given rise to a narrative of conservation (and by association all environmental concerns) being anti-poor and anti-development. People who take one of these two positions, or suspect each other of holding such a position, are highly critical of and antagonistic towards each other. Such relationships are evident within many municipalities.

That said, the post-1994 policy framework of developmental local government, which draws from the Constitution and provided the moral base for municipal legislative reform, overtly embraces notions of sustainability, as well as equity (Parnell *et al.*, 2002; Van Donk *et al.*, 2008; Swilling and Anneke, 2012). Thus, while climate

change may not be an explicit commitment of the post-1994 government agenda, there is broad consensus that any programme of urban transformation has to attend to both people and nature. In practice, however, the separation of environment and development goals continues to shape the willingness or reticence by some parts of the state, business and citizenry to engage with questions of climate change adaptation.

2.3.2. Undermines the formation of partnerships

The influence and participation of community-based actors in the design and implementation of climate change adaptation programmes is essential to ensuring that measures are contextually appropriate (Leck *et al.*, 2011). Adger *et al.* (2009) argue that social capital and joint community initiatives and actions can create a solid base for coping with, and adapting to, climate change and weather extremes. However, South Africa is effectively in a post-conflict situation (Beall *et al.*, 2005), where allegiances remain grounded in political affiliations rather than being issue-driven, and the activity and influence of social movements has been steadily declining in the country. This means that there are fewer opportunities to embed climate change adaptation in existing social forums and groups (Leck *et al.*, 2011; Sutherland and Buthelezi, 2012).

2.3.3. Undermines systemic change

Embedding climate change adaptation in the core business of local government requires that institutional cultures be open to transformation, and that institutions at all levels be adaptive and flexible to cope with the unprecedented and emergent challenges posed by climate change. However, as Aylett (2009) cautions, established organisational structures and institutional cultures are often highly resistant to change. This is true at the municipal scale in South Africa and makes the embedding of climate change adaptation and other sustainability processes particularly difficult (Swilling and Annecke, 2012; Leck and Simon, 2012).

2.3.4. Exposes the education and communication deficit

Awareness of global anthropogenic climate change and an understanding (even if a partial one) of the associated local risks and vulnerabilities is a prerequisite for climate adaptation. Much of the climate information that is produced is scientific and technical in nature and fails to highlight to the state, business sector and citizenry how the multiple activities of their daily lives are connected with (either

positively or negatively) both climate change mitigation and adaptation. The media, via television, radio and newspapers, plays an important role in providing information and presenting opinions to people about climate change. However, this information is often limited to the existence of the problem, providing little information on what it means, how it may impact on the state, business and ordinary citizens and how to adapt to it. Notwithstanding several efforts to popularise climate change issues for South Africans (Joubert, 2006; Wilson and Law, 2007) ignorance persists, even within municipal policy-making forums. The limited availability and circulation of research on the local dimensions of climate change is exacerbated by the poor quality of basic education that many South Africans have received, leaving many poorly equipped to critically engage and evaluate technical information.

2.3.5. Creates aspiration and equity challenges

Socio-economic inequality in South African cities creates particular challenges for municipal action on climate change mitigation and adaptation. Within poor communities many hold aspirations and expectations of development that replicate the infrastructure, technologies, goods and services that are currently enjoyed in affluent communities: free-standing houses, water-borne sewerage, grid electricity and high-consumption lifestyles (Sutherland *et al.*, 2012a; Gounden *et al.*, 2006). Suggestions that development in South African municipalities should not follow this historical, outdated model of urban development and public service provision (for example, in favour of high density living with locally sourced food, closed-loop recycling systems and off-grid, renewable energy sources as an alternative) encounter the moral dilemma of South Africa's apartheid history (Swilling, 2006; Schiermeyer, 2011). These notions of redress and equality can act as a barrier to the kinds of social and economic change required to reduce climate change risks and vulnerabilities. This is particularly challenging within the public sector, where much of the budget is committed to spending in under-developed parts of the city or municipality and not in retrofitting developed areas.

Part Three

3. Methodology

A qualitative, comparative research methodology has been used to investigate the major political, institutional and social factors that have influenced the formulation of climate change adaptation programmes in three South African municipalities. The comparative approach was 'relational' across the three municipalities, rather than measuring the cases against a universal model (Dear, 2005; Ward, 2008 and 2010; Robinson, 2011; Scott, 2012). In line with the 'comparative turn' in urban studies, the aim is to gain an understanding and offer interpretations based on commonalities and differences that emerge in different places, rather than to develop universal, law-like explanations (Ward, 2010; Robinson, 2011; Scott, 2012). The three case studies were selected on the basis of Cape Town and Durban being large metropolitan municipalities that are internationally recognised for their progress in addressing issues of climate change, and Theewaterskloof being a peri-urban local municipality within the Cape Town city-region (with key functional connections of water, food and exports) that has recently developed a strong sustainability agenda and thereby provides a useful point of comparison to the experiences of the large cities.

The researchers involved in conducting this study are in various ways part of and embedded in the local context being analysed, having done research for/with and consulted to the municipal officials establishing climate adaptation programmes in the three places. This positionality has provided invaluable access to research participants and relevant documentation, as well as contextual understanding that would be difficult to access by an outsider involved in a once-off, short-term research consultancy. However, it also introduces particular subjectivities and requires a certain sensitivity based on direct involvement in many of the nascent and on-going adaptation processes being reported. Collaboration between researchers in the study team on the comparative analysis and report-writing, as well as internal and external review processes, have helped to limit individual subjectivity from negatively impacting on the results of the study.

The connections and entanglements between the different actors and the programmes, policies and legislation at work in the three municipalities, as well as in broader regional, national and international arenas, were explored using a range of research methods. Literature was reviewed to present the relevant theoretical frameworks. Data on climate adaptation in the three municipal case studies was

collected through interviews and analysing government documents, using a standard set of questions designed to reveal the particularities of the institutional and political dynamics operating in each municipality. Based on the positionality of each of the researchers[6], different combinations of the empirical methods were used in the three case studies. Drawing insights from literature on the comparative turn in urban studies (Dear, 2005; Ward, 2010; Robinson, 2011), each case study was explored in relation to its particular geography, recent history in climate change programmes and its institutional context. Initial findings were presented (in the form of draft reports) to municipal officials for comment and augmentation.

The Cape Town case study was based on data collected through semi-structured interviews conducted with key personnel in the City of Cape Town, including 2 councillors and 23 City officials across 10 departments, as well as participation in the Climate Smart Cape Town activities leading up to and during COP17 (see Appendix A for a list of all people interviewed in each of the case studies). The large set of interviews, spanning many departments, was undertaken to elicit a cross-section of viewpoints from within what is a large and varied organisation consisting of many specialised units that deal with climate-related issues. Interview data was analysed alongside a review of key documentation produced by the City of Cape Town, including: the Integrated Metropolitan Environmental Policy (2001); Energy and Climate Change Strategy (2007); Energy and Climate Change Action Plan (2010); nine Climate Adaptation Plans of Action (2011), two Disaster Risk Management Plans (2011), Moving Mountains Report (2011), Cape Town Spatial Development Framework (2012), and the Climate Smart Cape Town Legacy Report (2012).

In eThekwini Municipality, a collaborative and iterative approach to collecting and analysing data was adopted as a result of the ongoing engagement between a researcher, a municipal official and a consultant working on climate change adaptation in the city. The Durban case study was co-produced by Dr Debra Roberts, the Head of the Environmental Planning and Climate Protection Department and the climate change champion for the eThekwini Municipality, Catherine Sutherland, an academic at the University of KwaZulu Natal (UKZN), and Nicci Diedrichs, a consultant who has worked extensively on environmental management in the city of Durban. A series of interviews were conducted with five municipal officials and two civil society actors around climate change adaptation in

[6] Anna Taylor conducted the research on the City of Cape Town, Catherine Sutherland on the eThekwini Municipality and Anton Cartwright on Theewaterskloof.

the eThekwini Municipality to triangulate and verify the understandings and insights produced by Roberts, Sutherland and Diedrichs.

In Theewaterskloof, the research was aligned with the municipality's green economy workstream. Twenty interviews were conducted (5 officials, 3 academics and 12 local business or NGO representatives). The area has benefitted from considerable research conducted by the University of Cape Town, Stellenbosch University, the Development Bank South Africa (DBSA), the Stockholm Environment Institute and private consultants on behalf of the municipality, commercial companies and large NGOs, such as the World Wildlife Fund (WWF). This previous research provides a useful archive to this study, but was complemented by interviews with the local municipality's Economic Development Officer and representatives of the Grabouw Sustainability Initiative, the DBSA, the Wine and Biodiversity Initiative (managed by WWF) and private companies (Appletiser, SAB Miller, Cluver Wines, Colours Fruit Exporters and Capespan). Jacqui Boulle is an experienced long-term consultant to Theewaterskloof (sponsored by the DBSA) who provided an invaluable resource in terms of understanding the process of change in the municipality over the past five years.

The chronology of events that reveal the development of climate change adaptation in all three municipalities was produced through the review of documents, papers and as a result of interviews with the main actors behind these programmes. Having identified the set of adaptation initiatives being undertaken in each of the three municipalities, drivers for initiating and constraints on progressing adaptation efforts were investigated, including a focus on the financing aspects, the role of crises, leadership and knowledge. The main actors were interviewed to reveal the politics and institutional arrangements of climate change adaptation within the municipality. This is documented in each of the case studies to provide the 'story' of climate change adaptation in each place. It is hoped that the documentation of these respective storylines proves valuable to on-going research beyond this study and to the work of officials in other municipalities across South Africa and beyond.

Part Four

4. Case Studies: Cape Town, Durban and Theewaterskloof

4.1. Case Study 1: Cape Town

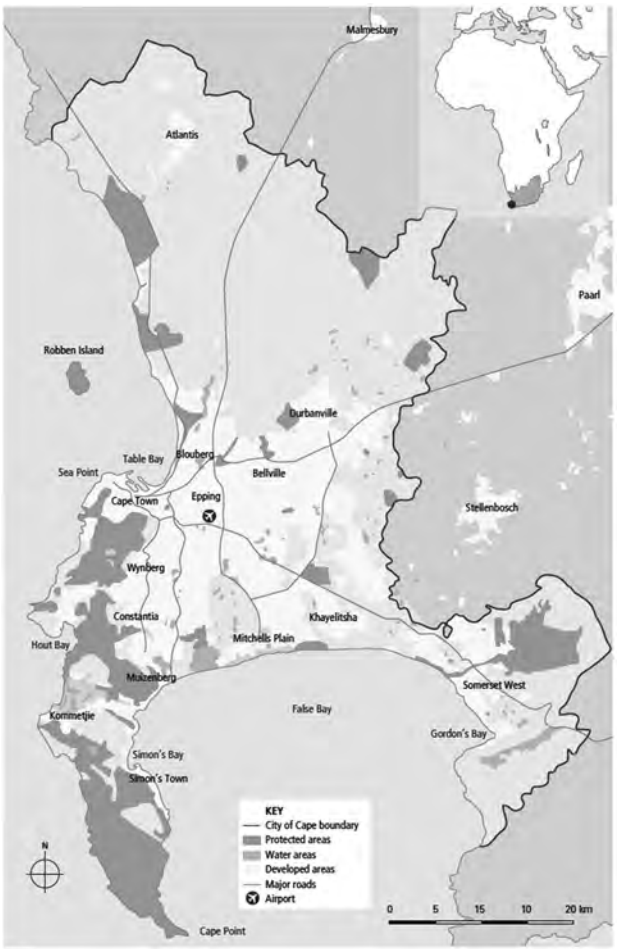
4.1.1. Municipal context for climate adaptation

The metropolitan municipality of Cape Town spans 2,460 square kilometres, with 307 kilometres of coastline, ranging from coastal lowlands to mountains peaking at 1,086 metres above sea level (Figure 3). Cape Town is home to a population of approximately 3.7 million people (City of Cape Town, 2011). It is also home to unique and world-renowned ecosystems, rich in biodiversity, with six vegetation types endemic to the city. However, many of the Cape's native species are under extreme threat of extinction due to habitat fragmentation through land use change, the proliferation of invasive species and poor land management practices (Rebelo *et al.*, 2011).

The natural and cultural heritage of Cape Town underpins a large tourism industry. Alongside tourism, key sectors of local economic activity include financial services, manufacturing, wholesale and retail trade and property markets. Cape Town also has a significant informal economy built largely upon retail, rented accommodation, domestic and home-based care work.

Despite ongoing efforts to redress the injustices of the apartheid system in South Africa, Cape Town has very high levels of inequality in terms of income levels, employment opportunities, access to public services (electricity, water, sanitation, education, health services, transport, etc.), disease burden and the threat of violence and crime. This inequality still has a distinct racial character, as evident in the distribution of monthly household incomes shown in Table 2 below. The legacy of apartheid policies is also still evident in the spatially divided nature of the city, with large swathes of the city marked by varying degrees of informality, where there is little or no land ownership or security of tenure, no authorised planning and enforcement of building regulations and very limited delivery of public services. This creates a very particular set of challenges for managing climate risks at the city scale.

Figure 3 *Map of Cape Town*



Source: City of Cape Town, 2011

Cape Town has a Mediterranean climate with warm, dry summers and cool, wet winters driven largely by the presence of the South Atlantic high pressure system during the summer and passing mid-latitude cyclones (low pressure systems) during the winter (Tadross *et al.*, 2012). The spatial variability in the city's weather and climate is largely determined by variations in slope aspect, land surface height and proximity to the ocean.

Table 2 *Monthly household income by population group in Cape Town, 2009*

Monthly household Income	Black African	Coloured	Asian	White	Total
None	1.16%	1.01%	0.00%	0.79%	1.01%
R1 - R1 440	11.46%	10.60%	8.49%	7.22%	10.12%
R1 441 - R2 880	28.19%	11.85%	21.43%	5.14%	16.10%
R2 881 - R3 500	11.39%	6.25%	0.00%	3.63%	7.40%
R3 501 - R7 000	23.56%	22.32%	4.69%	8.50%	19.50%
R7 001 - R19 999	14.01%	31.00%	15.53%	25.07%	23.63%
R20 000 and more	3.06%	9.96%	39.64%	26.85%	11.60%
Unspecified	7.16%	7.01%	10.22%	22.79%	10.64%

Source: Statistics SA, General Household Survey, 2009.

Cape Town currently faces a number of negative climate-related impacts such as water stress, excess stormwater and flooding, fires, coastal erosion and inundation, damage to homes and public infrastructure from heavy winds, health threats from heat stress and high concentrations of air pollution trapped under inversion layers, and species loss (City of Cape Town, 2006; Mukheibir and Ziervogel, 2007). The threat of experiencing many of these impacts is expected to escalate as climate conditions shift due to anthropogenic influences. Expected changes in Cape Town's climate, some of which are already being observed, include: prolonged periods of below average rainfall (*i.e.* inter-annual droughts); increasingly heavy downpours of rain (linked to flooding); longer dry spells between rainfall events; increased temperatures and evaporation; stronger winds; rising sea levels; larger storm swells and wave run-up; and stronger inversion layers that trap air pollution (City of Cape Town, 2006; Tadross *et al.*, 2012). Rainfall records from 1950 to 1999 indicate there has been a decrease in rainfall over the low-lying areas of the Cape Town area and an increase in the mountainous parts, while temperature records reveal a clear warming trend of approximately 0.16^{0}C per decade between 1960 and 2003 (Tadross *et al.* 2012). Climate model projections indicate a likely reduction in total winter rainfall over the Cape Town area and a 1-2.5^{0}C increase in annual average surface temperature by the period 2046-2065, extending to a 2.0-4.5^{0}C increase by 2081-2011 (Tadross *et al.*, 2012). A rise in annual mean sea level of 1.14cm per decade has

been measured on Cape Town's coast, and an even larger upward trend of 4cm increase per decade has been measured for annual maximum sea levels over the last 50 years, indicating larger storm swells reaching the city's coastline (Brundrit and Cartwright, 2012).

Local living and working conditions increase the threat of climate impacts. Key drivers of vulnerability within the city are: population and economic growth that are increasing water demands; the rising cost of securing new water supplies; extensive water leakages and wastage; degraded river catchments due to the invasion of alien plants and the accumulation of litter and pollution; stormwater drains blocked with sand, leaves and litter; large inhabited areas with no drainage or poor drainage; the density and informality of many settlements put residents at risk of fires; plantations of alien tree species within the city increase the risk of fire and soil erosion; and extensive infrastructure and property development along the coastline expose investments and critical infrastructure to sea surges and wind-blown sand.

The City of Cape Town municipality is currently under the political leadership of the Democratic Alliance, South Africa's main opposition party at the national level. By way of organizational culture, the City of Cape Town local government promotes a notion of good governance based on sound financial management and thereby takes great pride in its record of clean financial audits. On this basis, the City's finance department has adopted a highly conservative interpretation of the Municipal Financial Management Act, which tends to limit public spending to traditional, tried-and-tested programmes and technologies, and discourages the kind of flexibility and experimentation required for climate adaptation (De Visser, 2012; Cartwright *et al.*, 2012). It is telling that Cape Town has been at the forefront of seeking a legal mandate to engage in climate change adaptation and mitigation activities, while other pioneering municipalities saw no such need or constraint.

4.1.2 Origin and history of Cape Town's climate change adaptation programme

The City of Cape Town first expressed clear intent to address climate change with the drafting of an Energy and Climate Change Strategy, initiated in 2003 and adopted in 2007, and the development of a Framework for Adaptation to Climate Change in the City of Cape Town (FAC4T) in 2006, both coordinated by officials in the City's Environmental Resources Management Department (ERMD). This was enabled through the City of Cape Town's involvement in the Sustainable Energy for Environment and Development (SEED) programme, funded by the Danish

Development Agency (Danida), and as a result of growing concern over the degraded state of the city's coastline. The need for an Energy and Climate Change Strategy was stipulated in the City's Integrated Metropolitan Environmental Policy (IMEP), adopted by the City Council in 2001. Other than listing an Energy and Climate Change Strategy as one of the mechanisms for implementing the policy, the IMEP gives no other explicit mention of climate change. The IMEP does however articulate the importance the City places on protecting and enhancing the quality of Cape Town's environment to provide spaces for recreation and sustaining biodiversity, eradicating "environmental poverty" (City of Cape Town, 2001, p. 5), and providing energy, transport, water, waste, housing and livelihood support services that are safe, clean, efficient and environmentally sustainable.

The City of Cape Town's Energy and Climate Change Strategy puts energy at the front and centre of local climate change concerns, focussing attention on: the city's heavy reliance on fossil fuel based energy (notably coal-based electricity, petrol and diesel); the high levels of greenhouse emissions and other air pollutants associated with such energy consumption; and the existence of unacceptable levels of energy poverty within parts of the city. The Strategy articulates a need to dramatically shift both the supply and usage of energy, and presents targets for making such changes. The Strategy also mentions the need to assess climate impacts and develop strategic responses, but without providing any detailed goals or targets equivalent to those put forward for mitigation. The Framework for Adaptation to Climate Change in the City of Cape Town (FAC4T), commissioned by the City (with City budget) and produced by consultants from the University of Cape Town (UCT) in 2006, lays the groundwork for addressing the adaptation gap in the Energy and Climate Change Strategy, providing a review of climate trends and projections for the region, identifying a broad set of climate impacts and adaptation strategies across a range of key sectors, and laying out a series of steps to create an action plan for reducing climate risks and vulnerabilities facing the city. The ERMD staff and local consultants involved in setting out the IMEP, the Energy and Climate Change Strategy and the Framework for Adaptation to Climate Change in the City of Cape Town created the impetus and framework within which climate change adaptation work has gradually continued to develop within the City of Cape Town. A chronological overview of subsequent efforts to operationalise the principles contained in these documents is provided in Table 3 below and are described in more detail in the sections that follow.

Table 3 *Climate adaptation chronology for the City of Cape Town*

Date	Programme or event
2001	Integrated Environmental Management Policy adopted by Council
2003	First draft of Energy and Climate Change Strategy
2006	Framework for Adaptation to Climate Change in the City of Cape Town developed
2007	Energy and Climate Change Strategy adopted by Council
2008	Energy and Climate Change Committee established, comprising City Councillors
2009	Subcommittee on Energy and Climate Change set up within the Executive Management Team, comprising senior City officials
2008 - 2010	Sea-Level Rise Risk Assessment for Cape Town undertaken
2009 - 2011	Climate Change Think Tank set up to commission research and deliberate over the findings, Phase 1 undertaken through a partnership between the City of Cape Town, the University of Cape Town and Sustainable Energy Africa
2010	Energy and Climate Action Plan approved by Council
2010	Cape Town bids to host COP17 but loses to Durban
2010	Comprehensive Disaster Risk Assessment completed, climate change identified as an important set of hazards to plan for, both in terms of proactively reducing the risk of associated disasters and preparing to respond in the event of disasters occurring
2011	7 out of 9 sector-based Climate Adaptation Plans of Action (CAPAs) completed and presented to relevant Portfolio Committees, coordinated by ERMD
2011	Climate Change and Coastal Zone Hazards Plan completed, coordinated by the City's Disaster Risk Management Centre (DRMC)
2011	Cape Town Climate Change Coalition, a partnership between the City, local businesses, NGOs and academia, ran the Climate Smart Cape Town campaign in the lead up to COP17 and showcased Cape Town at the COP17 event, led by ERMD
2011	The City of Cape Town, represented by Alderman Belinda Walker, then Mayoral Committee Member for Economic, Environmental and Spatial Planning, sign the Durban Adaptation Charter committing to finance and act decisively in adapting to climate change, led by ERMD
2012	Cape Town Spatial Development Framework approved, including the establishment of a coastal edge in addition to a landward urban edge, coordinated by SPUD with input from ERMD
2012	City Council approves the City of Cape Town City Development Strategy that highlights climate change as a key risk and opportunity for Cape Town

Date	Programme or event
2013	Climate Change Think Tank Phase 2 initiated, funded through the Mistra Urban Futures programme, including commissioning research on reforming fiscal mechanisms for addressing large-scale coupled environment and development issues such as climate change
2013	Coastal by-law drafted and the City's coastal edge proposed to the Western Cape Government as the coastal set-back line under the Integrated Coastal Management Act
2013	Integrated Environmental Management Policy under review

4.1.3 Institutional arrangements and main actors involved in the climate change programme

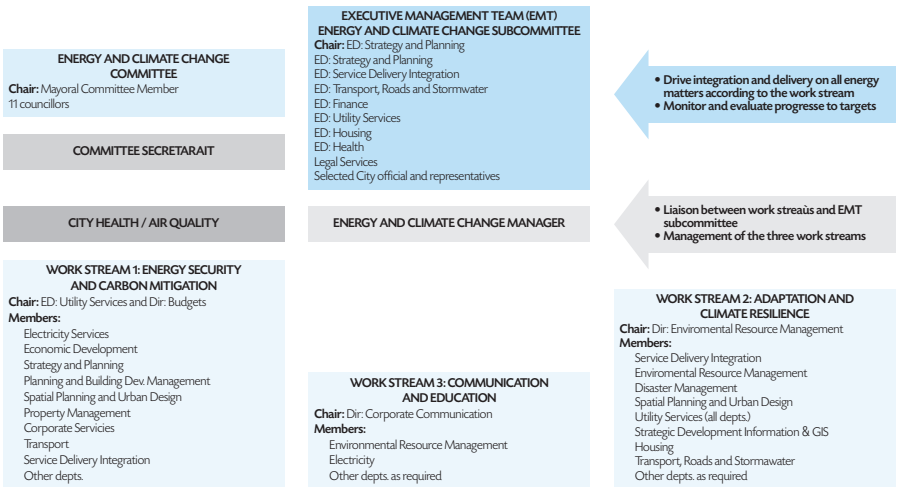
The City of Cape Town is made up of 221 democratically elected political representatives, called councillors, and a public administration of approximately 25,000 municipal employees. Politically, the City is currently led by the Democratic Alliance (DA), South Africa's main opposition party, which has a majority in both the City and the Western Cape provincial government. The City Council is led by an Executive Mayor, supported by a Mayoral Committee, a Budget Committee and a set of Portfolio and Ad Hoc Committees. The City administration is led by a City Manager, supported by an Executive Management Committee, and is organised into 12 directorates: the Office of the City Manager; Finance; Corporate Services; Utility Services; Community Services; Human Settlements; Safety and Security; Health; Economic, Environmental and Spatial Planning; Transport, Roads and Stormwater; Social and Early Childhood Development; and Tourism, Events and Marketing. The City of Cape Town is operating on an annual budget of R30.2 billion for 2012/13, of which 80.4% is allocated to operating expenditure and 19.6% to capital expenditure (City of Cape Town, 2012a).

The impetus for engaging the issue of climate change comes predominantly from within the Environmental Resources Management Department (ERMD), which is part of the Economic, Environmental and Spatial Planning Directorate, stemming from a concern over the environmental health of the City and the bearing that has on the well-being of Cape Town's residents. The issue of managing climate risks and adapting to climate change is also on the agenda in the City's Disaster Risk Management Centre, Department of Spatial Planning and Urban Design and Department of Roads and Stormwater, encouraged in part through numerous engagements initiated by ERMD staff over the last 4 to 5 years. Largely independent

from the activities of the ERMD, the City's Water and Sanitation Department, in collaboration with their Provincial and National Government counterparts, has for some time been factoring climate conditions into their strategic planning, infrastructure investments and operating practices, in terms of implications for both the supply and demand of water across the city. However, their future projections are heavily based on monitoring and extending current trends, more than on anticipating the potential for large-scale discontinuities in the climate system.

The City administration engages the political structure on the issue of adapting to climate change through the various Portfolio Committees linked to each Directorate, most notably with the councillors that sit on the Economic, Environmental and Spatial Planning, the Safety and Security, the Utility Services and the Transport, Roads and Stormwater Portfolio Committees, especially those councillors that represent the portfolios on the Mayoral Committee. Each of the sector-based Climate Adaptation Plans of Action, discussed in the following section, that have been developed by technical experts in the relevant departments, were presented to the relevant Portfolio Committee to be discussed and noted with the recommendation that the committee supports and monitors the further development of the plan – and presumably also the implementation thereof, although not stated as such.

Figure 4 *City of Cape Town institutional set-up for energy and climate change*



Source: City of Cape Town website, accessed 19 November 2012

In 2008, an Ad Hoc Committee on Energy and Climate Change was established, for councillors to deliberate on relevant issues and report directly to the Executive Mayor. While climate resilience and adaptation do appear in the terms of reference of the committee, the focus has to-date remained quite strongly on energy issues, pertaining more to mitigation than adaptation. In 2009, a Subcommittee on Energy and Climate Change was set up under the City administration's Executive Management Team, to work on three work-streams: Energy Security and Carbon Mitigation; Adaptation and Climate Resilience; Communication and Education (see Figure 4).

4.1.4 Approaches adopted to institutionalise climate change

In order to operationalise the Energy and Climate Change Strategy (2007), an Energy and Climate Action Plan (ECAP) was developed by the Energy and Climate Change Unit within the ERMD, led by Sarah Ward, in consultation with all relevant departments across the City administration. It was approved by the City Council in 2010. The ECAP lays out 11 objectives and lists a host of policy and planning activities and projects aimed at meeting these objectives. Some of these activities pertain to adapting the city in the face of existing climate impacts and a changing local climate, such as developing a Coastal Protection Zone Policy, developing Climate Adaptation Plans of Action, retrofitting low-income houses with ceilings and running a Climate Smart Cape Town Campaign, while the majority relate more to mitigation and energy security. The development of the ECAP was made possible with funding from the Danish Development Agency, Danida, through the Urban Environmental Management (UEM) programme, a 5-year programme with total budget of R35 million, of which R15 million was for a climate change component.

Using the framework put forward in the FAC4T (City of Cape Town, 2006) document, the City spent a number of years working to develop a local action plan for adapting to current climate risks and expected changes. The process was guided by Gregg Oelofse, Head of Environmental Policy and Strategy in ERMD, and undertaken by a series of consultants. Initially this was one comprehensive plan covering all relevant sectors and line functions within the City but, due to the complexity of the task and the largely independent operations of each municipal department, it was eventually decided to develop separate action plans for each of the relevant sectors. This decision was partly informed by similar adaptation planning experiences in Durban (described further in the next case study below). Based on a series of interviews and sector-based workshops with City officials from each of the relevant departments, nine Climate Adaptation Plans of Action (CAPAs)

were drafted for the sectors of: health; housing; planning; transport and roads; catchment, rivers and stormwater; water and sanitation; coastal; biodiversity; and disaster risk management. Each CAPA details the responsibilities of the relevant City department, the nature of the vulnerabilities to climate conditions faced by residents, communities, ecosystems and the City, the specific climate hazards and what sector-specific impacts result from these. Based on the identified hazards, vulnerabilities and impacts a list of adaptation actions is proposed for each sector (see sample of measures presented in Table 4, for full list see Appendix B). However, the plans do not go as far as costing each proposed action, assigning budget, responsibilities and timelines and suggesting measures for monitoring progress. This next step in the planning process is required for effective implementation.

Table 4 *Sample set of adaptation actions listed in the 7 completed CAPAs*

Sector	Measures
Catchment, River & Stormwater Management	Revise floodlines along inland watercourses and coastal estuaries
	Implement water sensitive urban design (WSUD) principles in all new developments Established buffers are along rivers or around wetlands that are located adjacent to new developments
	Encourage formation of internal/external multi-stakeholder partnerships to facilitate rehabilitation of rivers and wetlands
	Reduce flood risk of informal communities by: Relocation of informal households found to be subject to increased flood risk. Provision of adequate stormwater systems if the informal settlement area to be upgraded
Coastal	Designate Coastal Protection Zone
	Develop City Decision Support Tool for coastal development and investment decisions
Disaster Management	Develop and implement early warning systems so that residents of Cape Town are informed timeously of climate change related hazards, especially: Fire Risk, Heat Waves, High UV, Extreme rainfall, Extreme wind, Storm surges, Cold snaps, Flooding
	Regularly assess climate sensitivity of emergency response arrangements (e.g. access routes, communications, location of emergency shelters)
	Run education and awareness-raising programmes city-wide on early warnings, preparedness and responses to reduce vulnerability and increase resilience (with focus on youth)

Sector	Measures
Health	Ensure City Health facilities have capacity to deal with an increased number of cases of climate-related health conditions (including heat stroke, dehydration, burns and smoke inhalation, water-borne diseases, diarrhoea, respiratory tract agitation due to poor air quality)
	Monitor and manage the incidence and spread of climate-related water-borne disease vectors, working with City departments, Scientific Services, Catchment, River and Stormwater Management and Sports and Recreation
	Approach and encourage academic and research institutions to research the inter-relationships between air quality and climate change and the likely impacts of extreme events (including the mortality and morbidity rates associated with a drought or heat waves)
	Leverage more budget to maintain and expand the ambient air quality monitoring network in order to monitor changes in ambient air quality status and profile linked to climate change
Housing	Ensure climate change considerations are taken into account in City's low-cost housing programme and land identification
	Review low-cost housing designs and selection of materials with projected climate changes in mind research design options that increase the resilience to climate change
	Examine mechanisms for the top-up funding required to increase climate resilience of low cost housing
	Request climate change training programme for the housing department to consider climate in their day-to-day activities and ensure a commitment to implementation
Planning	Ongoing research to ensure City is abreast of advancements in climate science and knowledge on functional ecosystem services in Cape Town and the spatial implications of these to inform the development and/or review of plans and planning policies
	Factor climate change risks into City Spatial Development Framework, Integrated District Spatial Development Plans and Environmental Management Frameworks and local area plans and policies to increase City resilience and protect key City ecosystem services
Water and Sanitation	Model future water supply in the face of projected climate changes include further detail into existing climate change scenarios modelled in the WCWS Reconciliation Strategy
	Complete feasibility studies that consider alternative water resources to surface water supply (e.g. desalination, groundwater, water reclamation)
	Monitor groundwater recharge rates continue with baseline data collection to determine any changes to aquifer recharge rates and water quality
	Update response plan that addresses infrastructure failure as it relates to water reticulation and wastewater treatment and disposal
	Improve the efficiency of water use in residential and commercial development by changing consumer behaviour. Build an element on climate change into the Water Saving Campaign

Source: authors.

Developing the CAPAs proved to be a difficult process, marred by financial constraints, staff turnover, competing priorities within and between departments, and a perceived lack of mandate and authority held by ERMD to question city-wide operations. Even with the FAC4T document as a guide, the practicalities of local adaptation planning had to be learned through trial and error. Despite these difficulties, seven out of the nine sector-based CAPAs that had been drafted were finalised in 2011, signed off by the relevant Departmental Directors and presented to the respective Portfolio Committees. The last two CAPAs (for the biodiversity and transport sectors) remain under development, waylaid by other planning processes given priority.

In parallel to the CAPA process, the City partnered with the African Centre for Cities (ACC) at the University of Cape Town and a local non-governmental organisation, called Sustainable Energy Africa, to establish the Climate Change Think Tank (Cartwright *et al.*, 2012), made possible by securing R2 million in funding from Danida (linked to but separate from the aforementioned UEM programme). The aim was to better understand the risks posed by climate change to Cape Town and the opportunities and constraints for legislating, financing and implementing risk reduction measures at the city scale, with a focus on both mitigation and adaptation options. The Climate Change Think Tank is built on a model of multi-stakeholder deliberations and knowledge co-production, called City Labs, initiated by ACC to work at bridging the gap between research, policy and practice in addressing urban challenges in Cape Town. The adaptation aspect of the Think Tank focussed on issues of legal liability for climate damages and municipal mechanisms for financing climate adaptation, as well as on decision support tools for managing risks to the city's coastal zone from sea storm surges, rising sea levels, wind-blown sand and past spatial planning and building development decisions.

The work on managing coastal risks is built on previous research, which was commissioned and paid for by the City in 2008, that assessed the extent of observed sea-level rise (SLR) around the City's coast and the risk of future SLR, identifying the hotspots likely to be affected and the options for adapting to such risks. The project, entitled "Global Climate Change: Coastal Climate Change and Adaptation - A Sea-Level Rise Risk Assessment for Cape Town" consisted of 5 phases of research and reporting[7]:

[7] Access full reports for each phase on the ERMD website here: http://www.capetown.gov.za/en/EnvironmentalResourceManagement/publications/Pages/Reportsand.aspx#globalclimatechange

- Phase 1: Geographic Information System (GIS) inundation model for three sea-level rise scenarios
- Phase 2: Identifying areas at risk of temporary or permanent inundation under three sea-level rise scenarios
- Phase 3: Quantifying risks and costing impacts on existing coastal systems, infrastructure and property
- Phase 4: Identifying adaptation options to reduce sea-level rise risks
- Phase 5: Identifying risk factors relating to storm surge events and providing decision support for managing such risks

Research done under the auspices of the Think Tank was presented to and discussed with a group of City officials, City councillors, NGO representatives and academics in a series of Think Tank meetings. These events helped raise awareness of the local physical, economic and institutional dimensions of climate change and stimulated cross-sectoral debate around preferable courses of action (Cartwright *et al.*, 2012). However, participation in these events, especially by City councillors, and the level of debate was often less than hoped for by the organisers. These reflections are a basis for the current redesigning of the Climate Change Think Tank for phase 2, which is funded through the Mistra Urban Futures programme.

In a bid to host the 17th Conference of Parties to the UN Framework Convention on Climate Change (COP17), the City brought together representatives from a group of about 30 public, private and non-governmental organisations to form the Cape Town Climate Change Coalition in 2010. Having lost out to Durban for hosting the COP17 event, the focus of the Coalition shifted to developing the Climate Smart Cape Town (CSCT) campaign. The campaign involved various information drives and public events to raise awareness in Cape Town on climate change and the UNFCCC negotiations in the lead-up to COP17, and then representing Cape Town at the COP17 event, networking and showcasing what the City is doing to tackle climate change – a successful exercise in marketing the city.

In parallel with ERMD leading the development of the CAPAs and the running of the Think Tank, the City's Disaster Risk Management Centre (DRMC), as guided by national legislation, have been leading a process of developing a series of 27 multi-hazard DRM plans. According to the Head of the DRM Centre:

> "We need to remember that we are in a very fortunate position when it comes to disaster risk management in this country, we have the Disaster Management Act 2002 and the National Framework 2005 to guide us. Developing these gave

> the opportunity to rethink how we approach disaster management at a time when we could be informed by the Hyogo Framework for Action" (Gregg Pillay, Head of DRM Centre, 29/05/2012).

The hazards planned for were identified and prioritised through a Comprehensive Disaster Risk Assessment, completed in 2010, in which climate change came up as priority. The DRMC set up a task team to develop and implement a DRM Plan for Climate Change and Coastal Zone Process Hazards. The task team is led by an ERMD representative, first Penny Price, who was developing the CAPAs, and then Darryl Collenbrander, the Coastal Coordinator within ERMD. The plan presents a long list of what various role-players need to do to proactively reduce disaster risks and what to do in the event of a storm surge, algal bloom, heat wave or cold snap disaster – covering everything from revising flood lines to setting up road blocks. However, just like the CAPAs, the scope and scale of the plan makes implementation very difficult to progress, monitor and evaluate.

As a result of the work and cross-sectoral engagements of ERMD and leveraging findings from the Sea Level Rise study and the Climate Change Think Tank deliberations, the City's recently approved Cape Town Spatial Development Framework (CTSDF) has 'resilience and adaptiveness' as one of its guiding principles (City of Cape Town, 2012b). The CTSDF states:

> "In the long term, Cape Town's sustainability and prosperity will be determined by the city's ability to respond to change – rapid urbanisation, contrasting wealth and poverty, high unemployment, infrastructure and service delivery backlogs, resource scarcity, depleting oil reserves, energy and water supply constraints, and climate change. The spatial organisation of Cape Town will therefore need to be resilient and adaptable, and the City will constantly have to balance competing agendas for the provision of basic needs, social services and utilities against the stimulation of economic development and employment, the management of city growth, and the protection of environmental resources and systems" (City of Cape Town, 2012b, p. 29).

The CTSDF contains an ecosystem-based approach to adaptation, promoting the establishment and protection of natural buffer zones, both to reduce risks posed to human health and infrastructure by hazards like storm surges and sea level rise and to conserve local species of fauna and flora. One of the mechanisms is the demarcation of a coastal edge, in addition to a landward urban edge, beyond which the City will limit new developments. The challenge is implementing the framework.

Already property developers are submitting applications to have the urban edge expanded and City councillors are putting pressure on the City administration to revise the rules in favour of property developments, going against many of the agreed principles in the CTSDF.

To date, the City of Cape Town's efforts to adapt the city to climate change, driven predominantly by ERMD and DRMC, have aimed at building climate considerations into the work of the municipality across all the relevant line functions, rather than developing a single, consolidated adaptation programme within the environment department. Efforts thus far have focussed on building a knowledge base regarding climate impacts on the state of the city and integrating this new knowledge into municipal planning and decision-making processes. Doing so has required budget, expertise and time that are at a premium in the City. These efforts have given rise to some discernable adaptations to public infrastructure and services, such as: new stormwater drains with 15% larger dimensions to accommodate increases in run-off; some golf courses and factories using greywater instead of potable water; boreholes where the City is testing the artificial recharge of underground aquifers; and patches of coastal land where the City has rejected applications for property development. However, many of the adaptations being initiated are less tangible, process-based adjustments in the vision for the future of Cape Town and the considerations factored into policy and planning decisions. These are as important and often more difficult to achieve.

4.1.5. Factors that enable and constrain climate adaptation within the municipality

Finance and staffing constraints

The lack of resources to fund City positions, research, planning and projects on climate adaptation has been a severely limiting factor on the City's progress. Much of the adaptation work to date, such as co-managing the Climate Change Think Tank, developing the CAPAs and driving the coastal adaptation agenda in the CTSDF process, has been achieved on the basis of adding to the work load of existing City staff and securing small sums of money from internal and external sources, notably Danida, to commission consultants (for example to develop the adaptation framework and conduct the sea-level rise risk assessment). This makes progress slow and sporadic, it means skills and expertise are lost as people move on to other work, and makes it difficult to build momentum and institutional buy-in. The previous CAPA coordinator states that:

> "having no budget for implementation made the process of developing the Climate Adaptation Plans of Action very difficult because we could only get traction with real believers willing to commit their own money, or with those who were going to do the activities anyway for other reasons" (Penny Price, previously CAPA coordinator in ERMD, 05/07/2012).

The 5-year Integrated Development Plan (IDP) is a key strategic document guiding the City's budget allocations and spending. For climate change to become properly mainstreamed across the functions of the City it is necessary for it to feature strongly in the IDP process. The climate mitigation lobby within the City, led by Sarah Ward who heads up the Energy and Climate Change Unit in ERMD, has been relatively successful in getting energy issues on the IDP agenda, especially in the 2007/08 – 2011/12 IDP that included 'Energy for a sustainable city' as a strategic focus area. However, climate adaptation does not yet feature in the City's IDP any clear terms. This severely limits the extent of institutional purchase. Gregg Oelofse, Head of Environmental Policy and Strategy, argues that:

> "relative to the City's total spend[ing], next to nothing goes to climate adaptation. All that we've managed to do so far is on a shoestring budget. The City is not yet financially backing what it is we say that we are doing and need to do, for socio-economic reasons as well as environmental reasons, to tackle climate risks and make the city sustainable. If international funders want to effect real long-term change at scale, which is what we need to tackle a systemic problem like climate change, then they need to channel more funds directly to local authorities and we, as the City, need to be able to spend that money effectively" (Gregg Oelofse, Head of Environmental Policy and Strategy in ERMD, 21/11/2012).

Champions – technical but not yet political – and partnerships

Climate change would definitely not be on the City's agenda if it were not for key people within the organisation championing the issue, driving it onto the agenda and initiating climate-oriented work despite a lack of budget and institutional purchase. In the case of the City of Cape Town, these people have been in the City's administration, notably Gregg Oelofse, Head of Environmental Policy and Strategy in ERMD, Sarah Ward, Head of the Energy and Climate Change Unit within ERMD, supported by the ERMD director, Osman Asmal. However, the challenge for them has been the limited support, and in many cases resistance, from counterparts in other key City departments and the severe lack of political support for addressing climate change and issues of sustainability more broadly. The level of understanding

on environmental issues, particularly the linkages between ecological and socio-economic systems, remains very weak amongst local councillors. Barry Coetzee of the Utilities Department states that:

> "we need to educate everyone in the City to build climate change and sustainability considerations into their thinking, especially new people joining the City as they present an opportunity for doing things differently. We need to get people across all parts of the City to internalise the outcomes of studies, policies, strategies – not just the few that are involved in developing and evaluating them, as is currently the case" (Barry Coetzee, Manager of Technical Strategic Support in the Utilities Department, 19/04/2012).

Partnerships have been important in making progress on adaptation to-date. These include collaborations with organisations outside of the City, for example with the University of Cape Town, as well as with other departments and directorates within the City, notably those involved in the Climate Change Think Tank, the Cape Town Climate Change Coalition, and in developing the Energy and Climate Action Plan, the Climate Adaptation Plans of Action, the Disaster Risk Management Plans and Cape Town's Spatial Development Framework. Currently, partnerships between the City, the University of Cape Town and the Provincial government are being further developed and strengthened, specifically around topics of adapting to climate change and growing a greener economy. However, while there are many functional partnerships that are proving important, there is also lots of internal lobbying and contest over decision-making power and budget allocations, amongst officials in the City administration and between politicians in the City Council, which makes progress difficult to achieve and sustain.

Environmental framing and institutional positioning

One of the main factors limiting progress on tackling climate change is the extent to which it is seen as an environmental or green issue, separate from and even in competition with development, *i.e.* with the role out of basic services, the availability of land for housing and commercial activity, the use of resources for economic growth and employment. Faced with extreme levels of inequality, high levels of informality, an increasingly dissatisfied voter base and huge pressure from the private sector to make it easy for them to do business, many in the City promote and practice development at all cost. Many politicians and City officials perceive the City's environment department and the green lobby to be obstructionist and anti-development, protecting plants and animals over people and making life difficult for the rest of the City to do their job of raising public finance, delivering basic services

and approving developments. This is highlighted in a comment made by Alderman Belinda Walker of the Mayoral Committee for Economic, Environmental and Spatial Planning:

> "Environment people are in a green bubble, they need to go and talk to the economic development people, they need to show the economic benefit of different ways of doing things. Environmental people need to add value" (Alderman Belinda Walker, Mayoral Committee Member for Economic, Environmental and Spatial Planning, 25/04/2012).

However, Catherine Stone, the Director of Spatial Planning and Urban Design, reflects that the pro-growth agenda is all too frequently the overriding factor in decision making, when she states that:

> "politicians hate being advised to apply the precautionary principle; they want to make immediate gains" (Catherine Stone, Director of Spatial Planning and Urban Design, 19/07/2012).

Until linkages between human well-being and environmental processes are better and more widely understood across the city (within the public, private and civil society spheres), and climate change is thereby seen as a socio-economic challenge and a question of how the city develops, the competition over budget allocations, land use and access to water will continue to undermine climate adaptation in Cape Town. A consultant to ERMD, Lucinda Fairhurst, suggests that it is the institutional home of the climate change agenda that currently undermines progress. She states that:

> "it is a problem that climate change is housed within ERMD because it's always on the back foot, the mandate to address climate change should be housed in the City Manager's Office" (Lucinda Fairhurst, consultant to ERMD, 13/08/2012).

This is supported by Sarah Ward, Head of the Energy and Climate Change Unit in the City's environment department, in her comment that:

> "The Energy & Climate Change Unit ended up in ERMD because [the Director] championed the issues. It would be good to be in the Economic Development Department or in the City Manager's Office in terms of framing and positioning, but there are pros and cons to each" (Sarah Ward, Head of the Energy & Climate Change Unit within ERMD, 19/04/2012).

The benefit of positioning people working on climate change within the environment department is that there is support from the leadership to develop new policies, strategies and plans and to commit funds to experimenting with alternative technologies, financing and service models. The down side is that the department has a small budget, less decision-making power than other large departments with core local government functions, and has a reputation for being obstructionist. This means that on the one hand there is space for innovation within ERMD but on the other it is often sidelined and thereby struggles to mainstream new principles and practices across the municipality as a whole.

Events

Various events have created important windows of opportunity for getting climate change on the agenda. In 2006 and 2008 Cape Town experienced shortages in electricity supply from the national grid that led to periodic blackouts across many parts of the city. This brought considerable attention to the state of the city's energy balance (the levels and distribution of both supply and demand) and opened the door for discussions around alternatives. Sharp and regular increases in electricity costs to the City and the end consumer are keeping energy efficiency and alternative sources of energy firmly on the City's agenda. ERMD have been successful in coupling the energy and climate change agendas, using the energy security issue to raise concerns regarding climate change and associating the two issues very strongly in the mind of the politicians, to the extent that climate change is understood to be almost exclusively about energy concerns and more specifically electricity concerns. This success of getting climate change onto the agenda via energy security has, however, come at a cost for concerns regarding climate adaptation, closing down many institutional spaces to discussions on managing climate risks such as flooding, food security, water quality, etc.

Large storms hit Cape Town's coast in 2008 causing extensive damage to high-value properties and municipal infrastructure. This drew considerable attention to the findings of the sea-level rise study the City had commissioned. It helped in building support for establishing the coastal edge line in the City's new Spatial Development Framework and the current drafting of regulations and planning mechanisms to limit new development along the coast.

COP17 in 2011 provided a very productive window of opportunity when a great deal of attention was placed on the issue of climate change. Cape Town's attempt to host the event triggered a stocktaking exercise of what climate-related credentials the City could build on in terms of projects, programmes and expertise. Despite the bid

to host COP17 being unsuccessful, the coalition that had formed around the bid was further extended to prepare a strong presence at the event in Durban, showcasing Cape Town's ongoing efforts to be a green and climate smart city. Prior to COP17, the hosting of the 2010 World Cup had been a focal point for many City projects. Cape Town's successful bid to be Design Capital 2014 is the next big thing to draw attention and shape priorities within the City. It remains to be seen whether designing local responses to climate change features as one such priority.

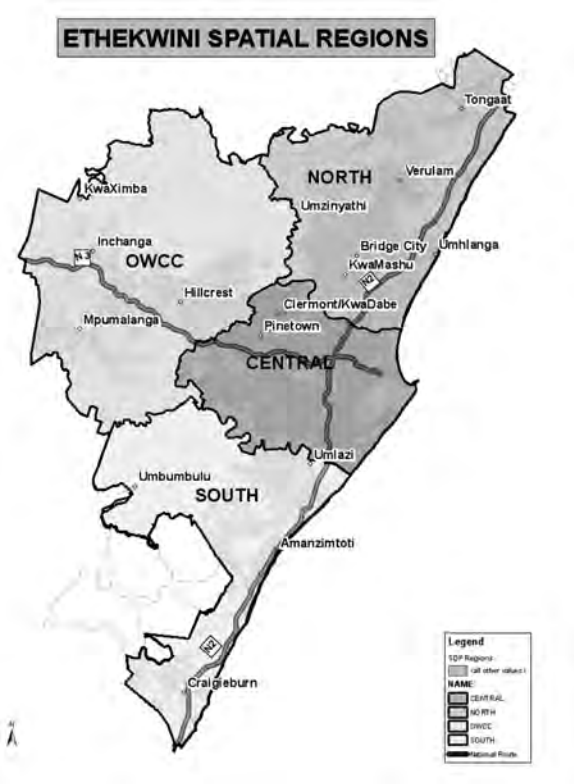
4.2. Case Study 2: Durban

4.2.1. Municipal context for climate adaptation

Durban is the largest port and city on the east coast of South Africa covering 2297 km^2, with a population of 3.5 million people (see Figure 5). There are approximately 15,000 people moving into the municipal area each month (eThekwini Municipality, 2012; McLeod, 26/10/2012). The Municipality faces challenges in terms of unemployment (43% excluding those employed in the informal economy), poverty (41.8% of the population are subject to conditions associated with poverty), housing and services backlogs (see Figure 6 below), a high incidence of HIV/Aids, and a small rates (tax) base (8% of households in the municipal area pay rates). The majority of Durban's population is considered to be urban (86%), and 14% considered rural, living in peri-urban and traditional rural settlements on the urban periphery. The rural areas have populations with particularly high unemployment rates, low household income, and poor levels of education. Residents have to commute to gain access to employment opportunities. Consequently, socio-economic inequality in the municipal area is reflected in its spatial geography (see Figure 6), providing the rationale for a differentiated housing and service delivery programme, which has implications for climate change adaptation (Sutherland and Buthelezi, 2012; Sutherland *et al.*, 2012a).

As a coastal city, Durban is subject to periodic cyclones and flooding. It is located in the Maputoland-Pondoland-Albany Region, one of 34 biodiversity hotspots in the world (eThekwini Municipality, 2012a). The physical geography of the municipal area is defined by its steep topography, its 98 km of coastline, 18 major catchments and 16 estuaries, 4 000 km of rivers, and nearly 75 000 hectares of open land forming part of the Durban Metropolitan Open Space System (D'MOSS) with valuable ecosystem services (eThekwini Municipality, 2012a). According to the eThekwini Environmental Planning and Climate Protection Department (EPCPD), the most significant

Figure 5 *Map of spatial regions within Durban*



Source: eThekwini Municipality, 2012a

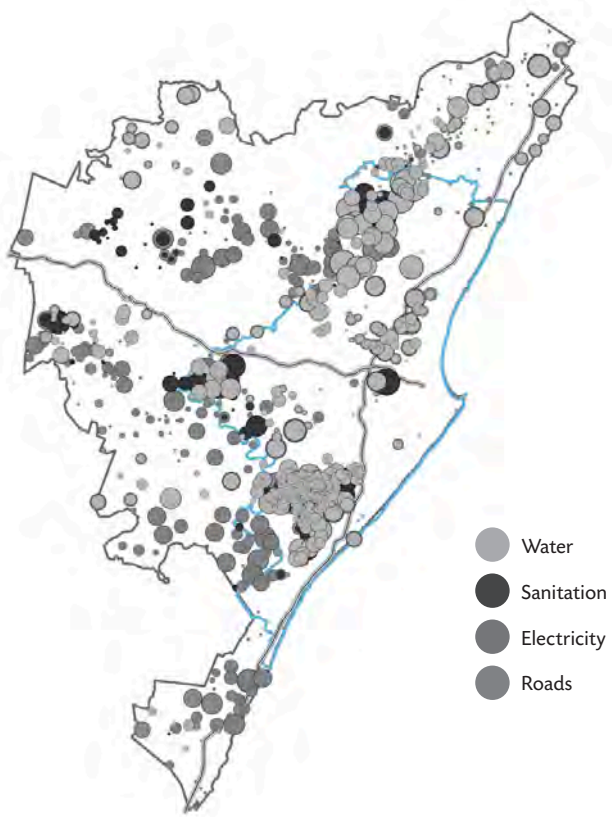
buffering effect against the negative impacts of climate change for local communities and infrastructure is provided by the functioning of these ecosystems (Roberts *et al.*, 2012). However, the natural environment is under continual pressure and many environmental systems have been impacted by inappropriate development, landscape change, invasive alien species and pollution (eThekwini Municipality, 2012a).

Climate change projections suggest that temperatures in Durban are likely to increase by between 1.5°C and 2.5°C by 2065, and between 3.0°C and 5.0°C by 2100 (eThekwini Municipality, 2012a). Rainfall is expected to increase on aggregate by as much as 500 mm per annum by 2100 (*ibid*). The area is likely to experience increases in extreme rainfall events and stream flow intensity with prolonged dry spells

between rainfall events (*ibid*). Sea level rise is already evident, occurring at a rate of 2.7 cm per decade, and this may accelerate into the future (*ibid*).

The climate change adaptation programme of the eThekwini Municipality has to respond to a large informal housing sector, where 55.4% of dwellings in the municipality are formal, 33.5% are informal and 10.9% are rural. Over one million people in the city live in informal dwellings, which represent 60% of the housing backlog. Water, sanitation and refuse removal services are either provided or planned for roll-out in these settlements. Interim services are being put in place in 166 prioritised informal settlements which are on the Municipality's housing plan, but that cannot be provided with full services or housing in the short term. Figure 6

Figure 6 *Combined service backlogs in Durban; the Urban Edge is shown in blue*



Source: eThekwini Municipality, 2012a

shows the services backlog in the city, and reflects the pattern of informal housing which is predominantly located along the Urban Edge in the transition zone between the urban and rural living environments in the city.

In the face of climate and development challenges, the vision of the eThekwini Municipality is that "By 2030 eThekwini will be Africa's most caring and liveable city" (eThekwini Municipality, 2012b). Achieving this vision is challenged by the wide range of socio-economic and environmental issues, which play out in a context of severe resource limitations. EThekwini Municipality is governed in a manner that reflects the distinct sectors or silos of local government. Although the sectors remain focused on their core responsibilities, often acting relatively independently, there is clear evidence that there is some integration and attempts at coordination across the sectors in relation to the planning, programmes and projects that are being rolled out in the city. EThekwini Municipality's approach to governance has enabled high levels of experimentation and innovation; below we unpack why this has been the case.

4.2.2. Origin and history of eThekwini Municipality's climate change adaptation programme

The environmental function of the Municipality was first established in 1994 and has grown from a one-person branch (Environmental Branch) to a department (Environmental Planning and Climate Protection Department) with a staff of 30 people, located in the municipal Development, Planning, Environment and Management Unit. The Environmental Planning and Climate Protection Department (EPCPD) is headed by Dr Debra Roberts. According to Roberts (2008), although the environmental management staff were aware of climate change in the 1990s, the post-apartheid challenges faced by the city meant that it was not a significant issue on the Municipality's environmental agenda.

In 1999, forward planning in the Environmental Management Branch resulted in climate change being seriously discussed for the first time. In 2000, with the support of external funding, eThekwini Municipality joined the ICLEI Local Government for Sustainability's Cities for Climate Protection Programme, and participated in the programme until 2006, when the funding ceased. Participation in this programme, and the parallel development of the Municipality's first landfill gas to energy Clean Development Mechanism (CDM) project in 2004, co-financed by AFD and the World Bank, raised discussion around climate change, but was not notably effective in building internal institutional momentum and knowledge.

Further progress was made when Roberts, as head of eThekwini's EPCPD, attended a semester-long programme at Brown University in Rhode Island (USA) in 2004. The opportunity for a local official to be exposed to detailed climate science, reflect critically on municipal practices and gain external input, led to the subsequent formation of the Municipal Climate Protection Programme (MCPP). It was the formalisation of this programme, under the leadership of Dr Roberts, that gave impetus to the city's climate change adaptation effort (Roberts, 23/08/2012; Tooley, 21/08/2012; Mather, 28/08/2012).

In 2007, major coastal storms caused flooding, coastal erosion and infrastructure damage. This created heightened awareness of climate related impacts amongst both politicians and citizens, and lent credence to the work of the MCPP. In practical terms, the MCPP incorporates both an assessment of local-level climate impacts and the development of locally focused response strategies. Although the MCPP includes both mitigation and adaptation, the early focus of implementation has been on climate adaptation, which differs from many other local government climate protection initiatives, which have a tendency to start with climate mitigation (Roberts, 2010). A main reason for adaptation achieving such prominence in Durban is that adaptation, or resilience-focused interventions, offer the potential for development-linked co-benefits that are responsive to the context. This has promoted political support (Carmin *et al.*, 2012; Sutherland *et al.*, 2012a).

In 2008, the eThekwini Municipality established an Energy Office in response to a period of national energy supply shortages, load shedding and significant electricity price hikes, and in so doing fulfilled recommendations made in the eThekwini Energy Strategy. The initial focus of the Energy Office was on energy efficiency in the municipal area to reduce energy demand. This role has subsequently expanded to include renewable energy development and climate change mitigation.

The hosting of COP17/CMP7 in 2011, where political leaders from national and local government played high-profile roles in international climate forums and councils, gave further political support for the city's climate agenda. It was in the lead up to COP17/CMP7 that the newly elected city mayor requested Roberts' assistance in understanding climate change and advancing the city's profile as a climate change leader.

Knowledge about climate change adaptation in the city has been developed through engagement with global climate change knowledge networks, research conducted locally by city officials, academics and consultants, and through experience gained

within the city by trial and error. The process of understanding climate change implications and adaptation began with commissioning researchers at the University of Cape Town's Climate Systems Analysis Group to downscale projections of future climate conditions from general circulation models (GCMs) to the local level. Initially, considerable attention was given to model accuracy, and while perceptions of a scientific approach were useful in underpinning and motivating action in some sectors, the inherent levels of uncertainty are now more readily accepted and actors acknowledge the fact they have to plan for many possible futures. In the case of climate change and biodiversity, the status quo data are so poor that all the focus is on taking non-climate stressors (*e.g.* habitat fragmentation and invasive species) off ecosystems to improve their adaptive capacity until more knowledge is available. Understandings of climate change within the eThekwini Municipality have contributed to, and been supported by, its sister city partnership with Bremen, Germany, and on-going dialogue with officials in other South African municipalities, most notably Cape Town.

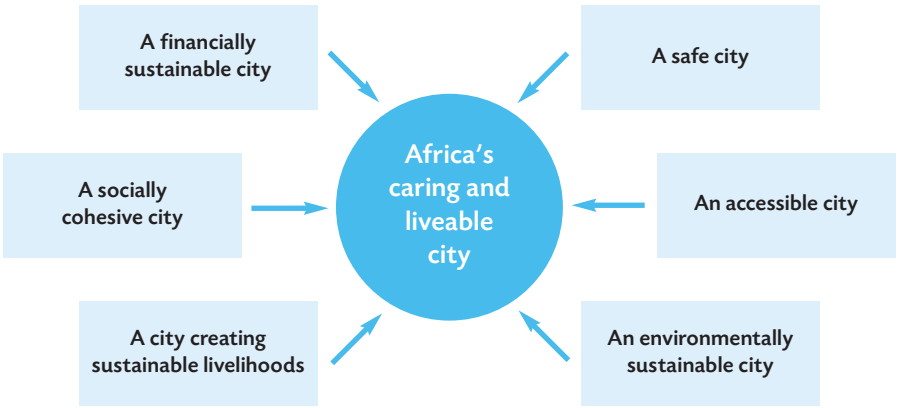
4.2.3. Institutional arrangements and main actors involved in the climate change programme

The eThekwini Municipality has a non-executive Mayor, an Executive Committee, and 205 councillors who represent 103 wards. Under the Local Government Municipal Structures Act (Republic of South Africa, 1998b), the Council opted for an Executive Committee decision-making system, as opposed to having an Executive Mayor as the bulk of the other cities, including Cape Town. This was due, in a large part, to the fact that an outright majority eluded the dominant party, the African National Congress, in past local government elections (Sutherland *et al.*, 2011).

The Municipality's current development priorities are outlined in its Integrated Development Plan (IDP) and Spatial Development Framework 2012/2013-2016/2017 (eThekwini Municipality, 2012a; 2012b). The main development aspirations of the city are presented in Figure 7.

Climate protection is the main responsibility of two different units in the city, the EPCPD (municipal champion of climate adaptation) and the Energy Office (municipal champion of climate change mitigation). The EPCPD and the Energy Office are in the process of developing a joint climate adaptation and mitigation strategy. This joint approach is aimed at developing complementary policy goals and

Figure 7 *Main development dialogues in the eThekwini Municipality*



Source:eThekwini Municipality, 2012b

avoiding an imbalance in focus and political interest between mitigation and adaptation (Roberts, 23/08/2012).

4.2.4. Approaches adopted to institutionalise climate change

Understanding of how to go about adapting to climate change in Durban did not emerge from a theoretical or analytical framework, but from trial and error during a phased process that began with a common sense and sector-based response, driven from within the EPCPD. Recognising a resistance within the wider municipality to addressing what are perceived to be environmental and not development concerns, especially within resource and capacity constraints, the EPCPD has deliberately not rushed to institutionalise climate change adaptation across municipal structures. Rather, the EPCPD has chosen to collaborate with people and departments in the municipality that are sympathetic to the climate change agenda and sufficiently capacitated to act on it. This approach involves fostering 'sector champions', or 'climate change moles', who work within their sectors to shift rationalities and practices of officials towards climate change adaptation (Roberts, 23/08/2012; Tooley, 21/08/2012; Mather, 28/08/2012). Given this approach of seeking like-minded colleagues, it is unsurprising that the early adapters have been from the natural resource management sectors *e.g.* Stormwater and Catchment Management, Sea Level Rise Management, and Biodiversity Protection.

The strategy of seeking collaboration around climate change themes in departments where there is existing capacity and leadership has been effective in the short term. For example, given the steep topography and intense rainfall in the municipality, the rapid integration of the Stormwater and Catchment Management departments into emerging climate change efforts has been essential. The approach, however, has also left gaps. The capacity constraints and ongoing restructuring of the Health Department and Disaster Risk Management departments, for example, has seen these departments make only minor contributions to the municipal climate change adaptation effort, in spite of the importance of their mandates. Similarly, some of the big infrastructural sectors (housing, roads and traffic) have yet to be approached and included in climate protection work. The strategic intention of the EPCPD has been to create 'quick wins' and to use its success with willing collaborators as a platform from which to expand its brief and include new departments. This represents a deliberate approach, one that has yielded effective use of limited resources and success to date. It remains to be seen how easily laggard and less functional departments can be brought into the climate adaptation programme, but the hosting COP17/CMP7 has provided useful impetus in this regard.

The institutional landscape is also a function of funding streams. Initially funding was diverted from the municipality's biodiversity budget to deal with climate work. The EPCPD only started receiving dedicated climate funding from the municipal coffers in the 2010/2011 financial year. These fiscal allocations have been repeatedly supplemented by donor funds from Danida, the Rockefeller Foundation, Bremen and ecological off-sets generated by the 2010 FIFA World Cup and COP17/CMP7. The ability to access international funding without restrictive conditionality has allowed eThekwini Municipality significant latitude in exploring climate adaptation through research and pilot implementation.

The 'no regrets principle' to climate change adaptation, which holds that climate change risk should be reduced even if the predicted intensity of climate change impacts do not materialise, has been a feature of eThekwini Municipality's effort and has enabled a diversity of projects and programmes to be developed, as shown in Table 5 (Roberts, 23/08/2012; Tooley, 21/08/2012; Mather, 28/08/2012).

Table 5 *Key components of Durban's Municipal Climate Protection Programme (MCCP)*

Phase	Components	Dates	Description
Phase 1: Impact Assessment	Climatic Futures for Durban Report	2006	Assessed the local impacts of climate change on Durban and proposed possible responses
	Investigate likely impacts of climate change on biodiversity	2007-2011	Aimed at improving the design and resilience of the Durban Metropolitan Open Space System (Roberts et al., 2012)
Phase 2: Adaptation Planning	Headline Climate Change Adaptation Strategy (HCCAS):	Initiated in 2006	To identify the municipal sectors that would be most impacted by climate change and to highlight appropriate and practical adaptation options, in partnership with line function representatives from all the sectors proved unsuccessful in initiating municipal adaptation activities due to the high level and generic nature of the strategy, excessive existing workloads, urgent development pressures, the perception of climate change as an unlikely threat and a shortage of skills and funds (Roberts, 2008)
	Municipal Adaptation Plans (MAPs)	2009	Due to lack of HCCAS success, it was decided that sector-specific Municipal Adaptation Plans (MAPs) should be developed, aligned to existing sector business plans; has been piloted in the municipal health, water and disaster management sectors
	Cost-benefit Analysis of MAPs	2011	Prioritise adaptation options identified in the MAPs, ranking options in terms of their cost per unit of adaptation, showed that socio-institutional interventions provide the greatest cost efficiency[8] (Roberts, 23/08/2012 Tooley, 21/08/2012)
	Climate Smart Communities Project	2008 - 2011	Community adaptation pilot projects undertaken in two poor, high-risk, low-income communities – Ntuzuma (urban) and Ntshongweni (rural) – focused on awareness and planning, food security, and micro-scale water and agriculture technologies
	Use of Community Theatre in Community Adaptation Planning	2009	Community theatre was used to communicate climate change threats and possible adaptation strategies during a community adaptation planning process in Amaoti, a community with many informal settlers

[8] For full details see Cartwright *et al.* (2013)

Phase	Components	Dates	Description
Phase 2: Adaptation Planning	Community Ecosystem Based Adaptation (CEBA)	2008 - present	Fulfilling commitments made by the eThekwini Municipality to host climate neutral mega-events (2010 FIFA World Cup and COP17), three large-scale community-based ecosystem restoration projects were initiated, contributing to poverty alleviation through addressing issues of environmental degradation and catchment management (Roberts et al., 2012)
	Green Roof Pilot Project	2009 - 2013	Pilot project on one municipal building to test the effectiveness of green roofs in terms of temperature amelioration and storm water management resulted in the production of a "Green Roof Guideline" (2011) document providing technical information on effective design for maximum climate and biodiversity benefits
	Sea level rise modelling	2008 – present (ongoing)	Built tool on a GIS platform to demonstrate the impact of projected sea level rise along the Durban coastline; the tool is used in the evaluation of coastal development proposals and coastal management plans
	Green Guideline Series	2010 - 2011	Produced as part of the Municipality's event greening programmes for the 2010 FIFA World Cup and COP17/CMP7 covering water, energy, waste, landscaping, and event management; the guidelines target businesses, schools and households promoting less resource-intensive and waste-producing lifestyles, buildings, landscapes and business operations
Phase 3: Developing the Tool Box	Urban Integrated Assessment Framework	2007 - 2011	Employed a GIS platform (which incorporates the sea level rise modelling tool) to visualise and spatially overlay the impacts of climate change on sectoral and strategic plans and policies, thereby helping to identify and evaluate the associated risks or conflicts intended to inform the IDP

Phase	Components	Dates	Description
Phase 4: Mainstreaming	Establishment of Climate Protection Branch in EPCPD	2007	A branch created within the EPCPD to deal specifically with the issue of climate change and climate protection
	Greening of mega events	2010 - 2011	Hosting the 2010 FIFA World Cup and COP17 in 2011 provided the opportunity to raise the profile of climate change and climate change adaptation at the highest level in the city
	Durban Climate Change Summit	2009	A focal point for climate change activities in Durban resulted in endorsing the establishment of the Durban Climate Change Partnership by a broad range of stakeholders
	Durban Climate Change Partnership	2010 - 2012	Established to bring stakeholders from civil society, business, NGOs and local government together in a structured way to address adaptation and mitigation issues aims to be involved in climate change advocacy and communication, ensuring that Durban's climate message is united and stakeholder climate change action coordinated – however, this is proving difficult, as discussed below

4.2.5. Factors that enable and constrain climate adaptation within the municipality

Climate change is still, in effect, given very low priority in the eThekwini Municipality as a whole, except in sectors where champions are active. Climate change champions have largely focused on the technical aspects of their work, without engaging at the political level. Debra Roberts has worked with both the incumbent and previous mayor to provide them with capacity and status in the biodiversity, climate change and environmental fields, in an attempt to gain support for her Department's programmes. The previous mayor received criticism from other politicians regarding the extent to which he was seen to be prioritising environment over development.

One of the main challenges in taking the climate change agenda forward is that the messaging comes from middle management, officials with a scientific focus, rather than from a broad range of officials and politicians (Roberts, 23/08/2012; Tooley, 21/08/2012; Mather, 28/08/2012). The politics and power struggles associated with the city operating in sectoral silos also plays a role in shaping climate change adaptation. Some sectoral leaders insist that their teams focus on "core business",

making it difficult to advance the type of cross-sectoral activity that effective climate change adaptation necessitates.

Officials and civil society representatives have called for greater participation by communities in the development of climate change adaptation plans and improved communication between the state and civil society around climate change (Ashe, 07/09/2012; Mather, 28/08/2012). The Durban Climate Change Partnership (DCCP) was an attempt by the EPCPD to develop a network of stakeholders to drive climate change adaptation. However, this has been put on hold due to variable interest from civil society and business, resource constraints and uncertainty over roles and objectives. The DCCP lacked a political or civil society figurehead to lead and manage a process of consultation and engagement with stakeholder groups, and there was a sense that certain civil society groups did not trust the partnership to be a legitimate platform (Ashe, 07/09/2012).

The eThekwini Water and Sanitation (EWS) unit is a powerful and innovative player in the municipality. The EWS unit has not explicitly identified climate change as an issue to be addressed in their core business. However, research on water governance in the municipality has revealed that many of the plans, programmes and projects of EWS are aligned with climate change adaptation, despite not being framed in this way (Sutherland *et al.*, 2012*a*). EWS is represented on the committee focusing on the development of the MAP cluster, but it is evident that there is some resistance to climate change thinking from this sector (Pfaff, 17/09/2012), and many of the engineers remain sceptical of the need to prioritise climate change in planning.

The new City Manager has suggested that the climate function be located higher up in the organisation, but there is a fear that too much centralisation at a high level will undermine progress and constrain the decision-making power of departments (Tooley, 21/08/2012; Mather, 28/08/2012). Champions in the municipality argue that there is a need to maintain better co-ordination of sectoral work, rather than creating a new structure and power base.

Another challenge in mainstreaming climate adaptation in the eThekwini Municipality has been the limited availability of climate adaptation skills. Although a Climate Protection Branch was created within the EPCPD in 2007, it was only in 2011 that the post of Manager for this branch was filled through a 'provisional' appointment. There is a paucity of professionals with specialist expertise in the field of climate change, particularly with climate adaptation, as opposed to mitigation,

skills. In the absence of in-house experience, the department relies heavily on external consultants and the vagaries of government procurement processes.

The international experience and exposure of Debra Roberts has enabled her to have an influence in the city that goes beyond her role as head of department. Durban is part of a network of cities and institutions engaged in climate change adaptation (for example, ICLEI and the sister city relationship through which Durban partners with Bremen) that has enabled sharing of experiences and knowledge, and served to raise the municipality's profile internationally. Forging the Durban Adaptation Charter at the COP17 Local Government Convention has enabled further linkages to be made. The Local Government Convention was funded by the national Department of Environmental Affairs (DEA) and supported by a local government partnership of eThekwini Municipality, SACN, SALGA, COGTA and ICLEI. EThekwini Municipality is now actively looking to operationalise the Charter as a means of creating new governance and institutional frameworks for adaptation at the local and international scales. The eThekwini Municipality has committed internal funds, as well as raised funds internationally, to drive forward the process of instituting the Durban Adaptation Charter.

The hosting of COP17 and the international platform it provided was successfully used to gather wider political support for climate protection within the municipality. The appointment of a new Mayor just prior to the meeting, and a new City Manager shortly after it, created important opportunities that were readily seized to garner new political and administrative support for the work of the EPCPD. The challenge is to sustain political support well beyond such mega-events by linking climate adaptation to local political priorities and pressing development issues (notably employment), thereby creating political opportunity through the climate agenda, for example through making job creation and income generation a main focus in the Community Ecosystem-Based Adaptation project.

4.3. Case study 3: Theewaterskloof

4.3.1. Municipal context for climate adaptation

Theewaterskloof Municipality is located in the Western Cape of South Africa (Figure 8). The municipality is a critical source of water for the province and particularly the city of Cape Town (the Theewaterskloof dam is a significant water storage resource) and it is a major agricultural contributor to the fruit and wine industry.

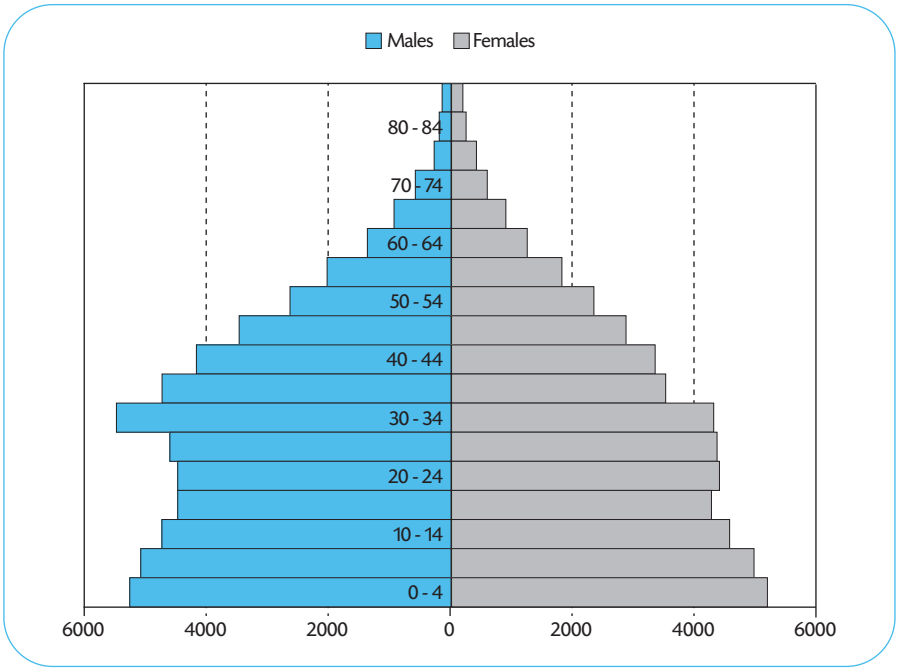
Theewaterskloof is topographically and climatologically diverse: mountainous and wet in the west, low-lying and arid in the east. The regional economy is dominated by agriculture and, in line with the topographical diversity, accommodates both intensive-irrigated and extensive-dryland agriculture.

Figure 8 *Map showing the Theewaterskloof Municipality in the Western Cape Province, South Africa*

Source: 2013 AfriGIS (Pty) Ltd., Google

The municipality of Theewaterskloof has a small population of between 103,281 and 109,997 (Palmer Development Group, 2009; Theewaterskloof Municipality, 2010). While the public discourse concerning Theewaterskloof suggests a rapid influx of migrant labourers, official statistics show a declining rate of growth, but still at a rate that is above that of the province and the country. The data suggest that between 2001 and 2006, population growth was experienced in all cohorts except for the 20-24 and 25-29 age classes (Figure 9), possibly due to outmigration of young skilled and semi-skilled job-seekers, and HIV-related mortality. The population increase has seen a burgeoning of informal settlements around the towns of Grabouw and Villiersdorp and has placed pressure on the delivery of services. Of the current Theewaterskloof population, 55.8% is estimated to be "urban formal", 23.3% is "rural formal", and 21.9% is "rural informal".

Figure 9 *Population pyramid for the Theewaterskloof Municipality*



Source: Provincial Government Western Cape, 2007

On average, Theewaterskloof is not an affluent municipality. Gross Domestic Product (GDP) per capita in Theewaterskloof was R16,810 and unemployment was 39% in 2010. The regional Gini coefficient is between 0.58 and 0.68, indicating high levels of inequality and critical development challenges. In 2001, 40% of the population between the ages of 5 and 24 in Theewaterskloof had "no formal schooling" (Statistics South Africa, 2001) and only 12.8 per cent of the working population had a Grade 12 pass, the final year of secondary school. In 2005, Grade 6 literacy in Theewaterskloof was reported at 41%, while numeracy in Grade 6 was 13.2% (Provincial Government Western Cape, 2007).

The Theewaterskloof economy is largely dependent on the agricultural sector (35%). Manufacturing (13%), including food processing, the public sector (12%), retail and tourism (12%) are the other key sectors of economic activity. The construction sector remains small, but has grown in the last decade. Of critical importance is the fact that the Theewaterskloof municipality represents the key

water catchment area for the City of Cape Town. Theewaterskloof itself, however, faces challenges in providing adequate water for its own economy, residents and the environment. While most climate models predict a generally warmer and drier climate for the Western Cape province, the same models anticipate more intense rainfall events and higher water yields in the mountainous areas on the western side of Theewaterskloof, suggesting that the area may become increasingly strategic as a water source.

By way of organisational culture, Theewaterskloof presents itself as "a reliable guinea pig" (Wallace, pers. comm.)[9]: a small, well-managed municipality that is constantly seeking to innovate and makes for a reliable partner in pilot projects. Theewaterskloof has been successful in harnessing the interests of a few large multinationals that are either located in the area or dependent on the agricultural produce from the area.

4.3.2. Origin and history of the climate change programme

Theewaterskloof does not have a stand-alone climate change strategy or policy. In spite of this, the local farming community, with the support of the municipality and NGOs, has a long history of environmental awareness, and engages a range of climate change adaptation (and mitigation) activities. In 2003, work presented at SANBI's Climate Change Workshop highlighted the problematic implications of warmer global temperatures (and particularly warmer nights) for apple production in the region. The research served to sensitise farmers in the region to climate change issues and contributed (alongside changes in market access and prices) to an increase in the planting of wine grapes and pears, both of which have a lesser chill requirement than apples.

Climate change awareness was also advanced by political and institutional transitions taking place in South Africa's agricultural sector. In 1996, the African National Congress (ANC) government discontinued the statutory single-channel agricultural marketing board system. Under this system, which had been in operation for the preceding four decades, South African farmers had been obliged to market their produce through state-controlled marketing boards that set prices and quotas. The discontinuation of this system saw fruit and wine farmers forging private supply contracts with international retailers, at a time when the same retailers in Europe and

[9] Stanley Wallace is the Municipal Manager for Theewaterskloof and made the comment as part of a workshop at the University of Stellenbosch (February 2012) to explore research collaborations.

the United States were being placed under increasing pressure to introduce environmental and social standards. The need to comply with these standards in order to secure markets saw farmers of export fruit and wine in Theewaterskloof scrambling to introduce climate adaptation, environmental sustainability and ethical labour practices, elements conspicuously absent under state-supported agriculture prior to 1996.

The general thrust towards environmental sustainability was further supported in 2002, when Theewaterskloof was designated a Project Consolidate Siyenza Manje (meaning "we are doing it now") priority node. Siyenza Manje was a partnership between the Development Bank of South Africa (DBSA), National Treasury, the Department of Provincial and Local Government, and the South African Local Government Association. Aimed at complementing the government's Project Consolidate, which identified underperforming municipalities to provide them with assistance, Siyenza Manje has seen the deployment of external experts in project management, engineering, town planning and municipal finance to municipalities to assist with the implementation of infrastructure projects and build planning and financial capacity to address service delivery backlogs and increase the municipality's rates base to the point where the municipality would be in a position to qualify for development loans. It was the DBSA supported Siyenza Manje interventions that lead to the formation of the Grabouw Sustainability Initiative, the designation of the Kogelberg Biosphere by UNESCO in order to secure the strategic water catchment area, and eventually the formation of a green economy strategy in 2010.

Crucially, DBSA support emphasised the need for long-term planning at a time when very few South African municipalities, many of which were newly demarcated in 2000, have been able to transcend the day-to-day needs of service delivery and rates collection, let alone formulate any long-term strategy. Theewaterskloof became an exception to the norm. The municipality, in collaboration with the DBSA and local NGOs, established a process aimed at delivering a 20-year vision, 'Vision 2030', of what Theewaterskloof could preferably become. In the context of South African local governments, it was a remarkable exercise, involving local business and community leaders. This concerted effort towards a long-term vision facilitated a fresh focus on long-term trends, and it was this focus that cemented the municipality's commitment to becoming a green economy leader. One of the five pillars of Vision 2030 calls for a green and low carbon economy.

As with all of South Africa's climate change adaptation efforts, it is too early to pronounce on the effectiveness of Theewaterskloof's programme of action, but in

2010 Theewaterskloof Municipality was awarded the 'top service delivery local authority' in South Africa at the African Access National Business Awards ceremony and in 2012 the Western Cape government recognised Theewaterskloof as one of its 110% Green flagship projects. The emerging recognition for Theewaterskloof's climate change efforts has developed from planning processes, research initiatives and projects, many of which did not begin with the specific aim of climate change adaptation and/or mitigation, but rather have had climate risk management emerge out of broader sustainability goals. Recent municipality-led climate change efforts have been on the mitigation side, focussing on:

- attraction of investment in utility-scale wind farms;
- extension of energy services and demand-side management (including solar water heaters and insulated ceilings) to low-cost houses in the Rooidakkies settlement;
- soil management efforts aimed at enhancing soil carbon in order to build drought resistance and sequester atmospheric CO_2;
- a review of biodigester and cogeneration technologies that could be linked to agribusiness operations.

In a number of these projects, the municipality works closely with Stellenbosch University to run pilot projects and gather in-field research intelligence.

By way of climate change adaptation, the municipality has supported the Groenland Water User Association (GWUA) and the broader Breede-Overberg Catchment Management Agency (the first functioning catchment management agency developed under the National Water Act of 1998) in applying integrated water resource management principles to Theewaterskloof's considerable water resources, and CapeNature in their efforts towards species conservation in the Kogelberg Nature Reserve Complex. In addition, a number of private and NGO led initiatives operating in the region target climate adaptation and resilience. These include:

- promoting the concept of 'ecological infrastructure' in the Palmiet Catchment in Theewaterskloof, by the WWF. The idea cites climate change impacts on fire and water run-off as an important part of the rationale behind labour intensive programmes that restore fire-breaks and riparian habitats. The innovation behind this idea involves applying an infrastructure approach regarding services to motivate for investments in natural capital.

- reducing farming impacts on land designated for conservation on privately owned farms, through clearing alien invasive vegetation, water resource rehabilitation and exploring soil carbon sequestration options, as part of the Wine and Biodiversity Initiative.
- and experimenting with drought resistant barley yields within the Better Barley Initiative, piloted by SAB Miller.

In the absence of a dedicated climate change strategy or programme, these efforts are being coordinated under Theewaterskloof's 'Vision 2030'. The process of formulating the municipality's long-term vision, and quest for sustainability, has provided a platform for collective action around climate change.

4.3.3. Institutional arrangements and main actors involved in the climate change programme

The rationale behind recent sustainability efforts on the part of the Theewaterskloof Municipality involved a combination of the need to remain competitive in international markets, to better manage local water, energy and human resources, available national funding and technical support from DBSA for this type of development, and the influence of local NGOs.

Since the advent of South Africa's democracy in 1994, Theewaterskloof Municipality has been hotly contested between the African National Congress (ANC) and the Democratic Alliance (DA). Following their election in 2002, the ANC secured DBSA's support through the Project Consolidate programme. It was this programme that enabled the appointment of a new Municipal Manager in 2005, Stanley Wallace, who had considerable business and technical experience. Under his leadership, and with the support of DBSA, the municipality began spending its allocated budget effectively, appointed new staff, and moved towards financial sustainability for the first time. In 2008 the municipality held a by-election and as a result switched to DA leadership. The DA chose to retain the services of Stanley Wallace as Municipal Manager and the full suite of senior management, an uncommon occurrence after a change in political leadership. The decision to retain officials, in conjunction with the historical fact that the lack of a clear political majority had necessitated considerable joint decision making, produced a degree of policy and institutional stability in Theewaterskloof that was central to the ability to look beyond day-to-day issues and engage in long-term planning. This was further aided by the support of an increasingly strong private sector-NGO-government consortium.

In 2011, the Democratic Alliance retained its political control over the municipality with a strengthened majority and continued to employ the same municipal manager. However, since then the ANC has embarked on an aggressive campaign to regain political control of the municipality. It has been a campaign marked by outbreaks of violence, and one that has for the first time in the past decade, polarised the previously consensus-based planning and decision-making arrangements.

The municipality's green economy and climate programmes have been located in the Local Economic Development Unit, but have received critical support from the Mayor and the Municipal Manager who oversee the consortium that jointly manages the Vision 2030 programme. As a consortium-driven process, Vision 2030 has been affected by recent changes in the political environment. In spite of this, the consortium has persisted, but without the critical support of unions and representatives from poor communities. The involvement and support of a critical mass of influential decision-makers from business, academia and the public sector, enables the municipality to manage programmes and projects effectively. This capacity, in conjunction with a track-record of environmental awareness, provides Theewaterskloof with significant climate change adaptation potential, even if existing and planned efforts are not necessarily framed in the adaptation discourse.

4.3.4. Approaches adopted to institutionalise climate change

By incorporating climate change dimensions in the "green economy" strategic focus, Theewaterskloof finds itself something of an unwitting climate change adapter. While many of the municipality's efforts would clearly qualify as part of a climate change adaptation programme and have been informed by experiences in programmes such as those in Cape Town and Durban, they are not being labelled as such. Seemingly, the absence of climate change adaptation as an explicit focus has obviated the need for municipality-wide climate change impact studies and distinctions between climate change adaptation and sustainable development, and possibly enabled more rapid implementation.

The long-term impact remains to be seen, but experiences in Theewaterskloof suggest that placing climate change initiatives within the Local Economic Development Unit, under the auspices of a green economy focus, enables participation from a wider spectrum of organisations and makes for easier integration with existing socio-economic and business programmes, avoiding a perceived clash between environment and development agendas. Unlike the larger municipalities, Theewaterskloof does not have a team of environmental experts and

climate change champions. Instead it has sought to embed climate knowledge in its general municipal management practices and planning. This finding may be particular to a smaller municipality, but Theewaterskloof has not pre-occupied itself with on-going projections of climate change impacts, instead focussing on a range of no-regrets climate initiatives that have the potential to deliver economic co-benefits and in so doing has met little scepticism and resistance.

4.3.5. Factors that enable and constrain climate adaptation within the municipality

Environmental awareness in Theewaterskloof is not a recent phenomenon. The focus on climate and the green economy in their Vision 2030 comes from a history of environmental awareness. As an agricultural economy, many of the local residents and businesses have a highly developed sensitivity to environmental change and recognise the value of healthy, well-functioning ecosystems. For some time there have been programmes around integrated water management involving the Groenland Water Users Association, sustainable farming and integrated pest management through the Sustainable Fruit Initiative and the Sustainable Wine Initiative, and biodiversity conservation, especially within the UNESCO designated Kogelberg Biosphere Reserve, and also on farms through the Wine and Biodiversity Initiative. Both the South African office of WWF and the nearby University of Stellenbosch have frequently used Theewaterskloof as a place to conduct pilot environmental projects and research.

A key feature of the Theewaterskloof Municipality has been its ability to experiment and innovate. To a certain extent, this ability has been driven by the presence of large agribusinesses in the region and their integration into international markets. The competitiveness of the markets in which SAB Miller, Appletiser, various estate wine farms and fruit export companies such as Capespan, Del Monte and Colours operate, necessitates that these companies seek to differentiate themselves. They do this through proactively responding to global issues such as climate change and water scarcity. It is a measure of the integration of the global fruit, wine and beer value chains that consumer concerns in global markets have translated into land-use and resource management practices in places of primary production, such as Theewaterskloof.

While international markets are undoubtedly influential in Theewaterskloof, this should not obscure the role of the local decision makers. As a function of the municipality's scale, location, proximity to a major national university, and the types

of industries that are found there, it is also home to a critical mass of innovative, influential and capable individuals, who detect new trends and champion new ideas and technologies. The process of formulating Vision 2030 brought together a remarkable group of individuals that collectively was able to ensure success in terms of project management and innovation. It is this group, with resources from the municipality, DBSA, local businesses, and NGOs that has driven the municipality's environmental and climate change response.

The relative success enjoyed by Theewaterskloof in creating a profile as a sustainability pioneer should not mask the fact that the municipality continues to confront acute socio-economic challenges. A shortcoming of the Theewaterskloof process is that it has been driven by a small group of committed individuals without necessarily gaining the support of a broad set of stakeholders, and in particular Theewaterskloof's poorest residents. Gaining this support is not straight-forward. Theewaterskloof is comprised of a diverse set of people, with an array of needs and aspirations. These include migrant labourers, construction companies, entrepreneurs, long-standing farm-worker households, agribusinesses of various scales and tourism operators. It was the underlying backlogs in service delivery, and the sense that the strategic trajectory of the municipality was not aligned to all interests (something that is inherently difficult for a municipality in which inequality is high), that fomented political unrest in late 2011 and early 2012. Therefore, a key challenge for Theewaterskloof is using its impressive track-record to include new residents and migrant labourers in a pro-poor effort to meet climate challenges. Recent labour-absorbing green economy programmes (for example those relating to the restoration and maintenance of ecological infrastructure) offer potential to ensure that climate change adaptation does not become seen as a luxury of the elite and offers real risk reduction outcomes for those most vulnerable.

Part Five

5. Comparative analysis and emerging themes

By comparing and contrasting the three case studies (see Table 6 for a summary overview), a number of themes emerge relating to the institutional, political and social factors that shape climate change adaptation at the municipal scale in South Africa.

Table 6 *Summary of key variables in the three cases to compare and contrast*

	Cape Town	Durban	Theewaterskloof
Funding / financing	External funding leveraged (e.g. Danida IDRC Mistra) and some City budget committed by ERMD and DRMC	External funding leveraged (e.g. USAID Danida) and some City budget committed by EPCPD and other departments	Development finance from DBSA; private sector investment in sustainability initiatives
Politics	Politicians sceptical of environmental lobby; adopting policy frameworks and plans but not supporting their implementation	Mayor updated on issues and actively promoting the city's climate change work on international platforms (e.g. World Mayors Council on Climate Change) but some local political push-back to focus on more primary development priorities; linking climate adaptation with job creation priorities	Stability of municipal management through political contest and switch in power; growing political tension undermining consensus-based decision making; strong influence from agribusiness: water scarcity a common threat
Public administration	Conservative financial management; ERMD championing CC adaptation; DRMC championing disaster risk management (including climate risks)	EPCPD championing CC adaptation; supported by Municipal Manager and Mayor; uptake of climate adaptation in aligned natural resource management departments	Recovering financial administration after being declared insolvent; technical and management capacity strengthened through long-term appointment of consultants; sustainability initiatives positioned within Local Economic Development Unit

	Cape Town	Durban	Theewaterskloof
Key frameworks	Energy and CC Strategy and Action Plan; Framework for Adaptation to Climate Change in the City of Cape Town (FAC4T); Climate Adaptation Plans of Action (CAPAs); Cape Town Spatial Development Framework	Municipal Climate Protection Programme (MCPP); Municipal Adaptation Plans (MAPs)	Vision 2030; Green Economy Strategy; Wine and Biodiversity Initiative; Working for Water programme
Networks & key partners	CC Think Tank; CT CC Coalition; Sustainable Energy Africa; ICLEI; University of Cape Town; African Centre for Cities	Durban Climate Change Partnership; ICLEI; CSIR; Tyndall Climate Change Research Centre (UK)	Vision 2030 Consortium; Grabouw Sustainability Initiative Forum; Stellenbosch University; WWF; CapeNature; SAB Miller; Appletizer
Research & training	Design of adaptation framework; sea level rise modelling climate change local impact studies; legal review of liability for climate change damages; professional short course on using climate information at UCT	Course at Brown University; climate change local impact studies; sea level rise modelling; cost benefit analysis on adaptation options; GIS tools for decision support	Pilot site for sustainability research by Stellenbosch University; water quality and quantity monitoring; biodiversity reviews; design of green economy framework
Key events	Large winter storms and sea surges; hosting Local Climate Solutions for Africa conference; participating in COP17	Large winter storms and sea surges; 2010 FIFA World Cup; COP17 and concurrent Local Government Convention (launched Durban Adaptation Charter)	Declaration of insolvency; DA retaining services of municipal managed appointed under previous ANC leadership; receiving Project Consolidate support

The emerging themes are discussed under their respective sub-headings below:

5.1. The environment and development divide

The climate change adaptation agenda in South Africa has largely been driven by municipal environmental teams, who have engaged directly with the science of the global climate change phenomenon. Despite various ongoing efforts to reveal the local (and global) inter-linkages between development efforts, living conditions, lifestyle choices and changes in the climate, climate change adaptation is not yet

conceptualised as a development imperative by many key municipal decision-makers, at least not in practice. An increasing number agree, in principle, that the long-term vision for the city is one of being climate resilient and well adapted to shifts and extremes in climate conditions. However, climate change adaptation is still widely perceived within municipalities as a call to respond to a vague and distant threat that complicates (and thereby delays, protracts and makes more costly) immediate tasks of extending public infrastructure and rolling out basic services as quickly, extensively and cheaply as possible to improve living conditions and economic activity in the near term. The underlying imperative in South Africa remains to redress the injustices of the past in relation to the current status quo as quickly as possible, delivering subsidised houses, public services and jobs to "previously disadvantaged" communities as quickly, cheaply and extensively as possible, over and above preparing for the future.

A deep-seated division between issues of environmental management and socio-economic development persists in South Africa and acts as an impediment to greater sustainability and climate change resilience in municipalities. There are many working in the public sector who see environment and development as separate agendas competing for scarce resources and political attention. There is a long, well-documented history to this division in the South African context, rooted in the environmental practices associated with the politically motivated "green agenda" during the apartheid era (Scott and Oelofse, 2009). As a result, as long as the issue of climate change remains pigeon-holed in the environment sector, both conceptually and institutionally, it remains politically marginalised within municipalities. Changing this will require more holistic systems thinking when it comes to problem definition and problem solving in both the political and technical spheres. The incorporation of climate change within a 'Green Economy' approach, as adopted in Theewaterskloof, may yet prove effective in bringing climate change into the mainstream, but only provided that it is able to move beyond the narrow, technical economics that is used to balance budgets at the local level, and include notions of welfare and political economics to avoid reinforcing existing inequalities (IIED, 2009; Sutherland, *et al.*, 2012c). Similarly, attempts by environment departments in eThekwini and City of Cape Town municipalities to demonstrate employment opportunities in adaptation projects may yet find a political resonance and result in greater support and integration.

5.2. Competing priorities between climate change mitigation and adaptation

In the emergence of climate change related programmes in each municipality, programmes of climate change mitigation and adaptation have begun competing for resources and space on the agenda. This is particularly the case in Cape Town, where energy security and efficiency linked to climate change mitigation has dominated the agenda, while climate risks, impacts and adaptation options are still being assessed. In some ways the mitigation-orientated work around energy efficiency and renewable energy has helped to get climate change onto the municipal agenda in Cape Town, and thereby opened up space for adaptation to be discussed as an additional and necessary local response to the problem of climate change, especially in a context of widespread poverty and vulnerability to climate impacts. However, competing efforts to gain attention and support for the two different sets of responses has at times undermined progress on both and made it difficult to adopt an integrated and holistic approach to climate change across the sectors in the municipality.

In Durban, the early climate change impact study conducted by the CSIR, in conjunction with discussions Debra Roberts held within the Municipal Council's Economic Development and Planning Committee, led to adaptation, rather than mitigation, being considered the immediate priority. However, the mitigation agenda has been growing alongside adaptation since the Energy Office was established in 2008 and efforts are underway to create a joint, integrated climate change response strategy.

In Theewaterskloof, climate change mitigation and adaptation are part of a broader sustainability and economic viability agenda, rather than stand-alone agendas within the municipality. To a certain extent this has circumvented tensions over whether to prioritise adaptation or mitigation. The important role of NGOs and corporations, relative to the municipality, has seen a natural delineation of much of the responsibility for adaptation and mitigation that has been determined by market expectations, core competency and the operational needs of the respective institutions.

5.3. Importance and challenge of partnerships

In spite of the perceived constraint created by the financial regulations governing municipal spending, adaptation success almost invariably involved some form of

partnership between the municipality and funders, research institutions and NGOs. The City of Cape Town has, from the outset, looked to engage a broad network of local actors in the process of addressing climate change. This has been through informal networks, professional associations and the formation of the Climate Change Think Tank, made possible by leveraging various funding sources from outside of the municipality. The Think Tank was set up to create a community of research and innovation cutting across local government, academia, consultancies and NGOs to facilitate deliberation on different framings of the climate change problem, the implications of impact assessments and paths the city might navigate to better adapt. Coordinating such a partnership, notably managing a disparate set of expectations, has proved a huge challenge yet sufficiently rewarding, in terms of gaining new insights and institutional momentum, to continue the effort into a second phase (Cartwright *et al.*, 2012).

In Theewaterskloof, the framing of the sustainability agenda has been undertaken by a broad range of actors that include the private sector, most notably larger agribusinesses in the area that are linked to international markets, the Development Bank of South Africa, consultants, academics, NGOs and farmers. The private sector has played a major role in framing the problem and its 'solutions' as the companies in this area seek to differentiate themselves in the market by proactively responding to global concerns, including climate change and water scarcity. The ability of the municipality to engage in such partnerships and coordinate a long-term strategic planning exercise was bolstered significantly through the support provided by national government and the DBSA.

By contrast, in Durban, partnerships and associated learning has been shaped by the personal and professional networks, spanning local, national and international scales, of one individual champion within the municipal administration, who has single-handedly driven the climate change adaptation process through the influence gained from being considered an international leader on climate change in developing world cities. The Durban Climate Change Partnership was an attempt to ensure greater and broader deliberation around climate change adaptation programmes. However, the lack of leadership from outside EPCPD, funding issues and tensions between civil society groups and the local state has stalled this partnership and revealed the extent to which values, interests and goals differ between different stakeholders when it comes to establishing priorities for development and assessing the trade-offs between various options for public investment and spending.

All three cases reveal that securing new and additional resources external to the municipal budget has been critical to adding climate change to the municipal agenda, commissioning targeted research and developing climate change programmes and projects. In a municipal context where both officials and politicians have vested interests in the size of the budget committed to fulfilling their mandate, restructuring the existing municipal budget is especially difficult. In all three cases, access to external resources created opportunities for climate change interventions led by progressive sector-based officials. Significantly for donors, most successful partnerships appear to have been long-term and focussed on enhancing human and institutional capacity, *i.e.* the funding of a long-term advisor in Theewaterskloof, the funding of a multi-partner Think Tank in Cape Town and ongoing research funding for the eThekwini Municipality's EPCDP. This is in contrast to the more common short-term, project-focussed funding favoured by donors, which tends to deliver relatively low levels of operational change at proportionately high cost. This may be due to the difficulty of embedding short-term, consultancy-led projects in regular budgeting and political decision-making processes.

5.4. Multiple starting points for the adaptation process

It is evident from the research that there are multiple starting points or catalysts for the process of adaptation at the municipal scale. Committed leadership, disaster events, electricity and water shortages, knowledge building through international linkages and funding opportunities have all been catalysts for planning and implementing climate change adaptation in the three case studies. Typically, it was not one but a combination of these that created the impetus to initiate the adaptation process.

Identification of climate change related problems and the building of knowledge around observed and expected impacts and vulnerabilities were important starting points in both Durban and Cape Town. In Theewaterskloof, climate change adaptation emerged as a result of the development of a sustainability framework for the municipality that includes tackling the water and climate stressors facing agribusiness in the area. The starting point in this case was the development of an innovative long-term strategy for a municipality that was under intense financial and service backlog pressure.

It is still very early in the adaptation process in all three of these municipalities. Climate change adaptation programmes are expected to evolve as learning in this

field of work feeds back into the politics and operational practices. Experimentation, innovation and protection from the fear of failure through supportive leadership are therefore critical at this point. At the local level, climate change adaptation is often introduced under, or attached to, other more familiar labels of biodiversity (in all three municipalities) and coastal zone management (in Durban and Cape Town), integrated water resource management (all three municipalities) and sustainable agriculture (Theewaterskloof). It remains a question as to the benefit of differentiating climate change adaptation in terms of agenda items, funding streams, budget lines, expertise, organisational units, discussion forums, etc. Some distinction is required to draw attention to the need for reconsidering current business-as-usual practices to factor longer-term future climate considerations into plans, designs, budgets and decisions; however, too much separation generates opposition and resistance. It seems unlikely that there is an optimal balance between distinction and integration of climate change adaptation that is universally applicable. Rather, distinguishing and integrating climate change is a dynamic balance that has to be negotiated in each context based on the current socio-political, organisational and economic forces at play.

5.5. Scale and the appropriate level of governance

The importance of local government in driving climate change adaptation in the South African context is strongly evident in this research. Although there is evidence of climate change planning and policy-making at the national level, the three case studies demonstrate that climate change adaptation has largely been developed within municipalities in response to local concerns rather than as a response to guidance or directives from the national or international level.

Notwithstanding the need for a globally binding agreement and the realisation that no local authority can reduce climate change impacts in isolation, the study shows that municipal adaptation measures can significantly shape the impact of climate change at the local level. These local measures include actions and programmes that are already familiar to officials and practitioners. Activities such as clearing alien vegetation from riparian zones, clearing storm-water drains and overseeing judicious spatial planning and property development take on new significance in the context of climate change risks and can have a profound impact on the manifestation of these risks. Significant climate change adaptation options then readily exist within the realm of municipal management and effective adaptation in the three case studies has involved efforts to link these actions with a climate change agenda.

However, linking between multiple scales and sites of governance appears to be a necessity in other ways, notably financing and legal frameworks. While the focus of this study is local, it is significant that all three municipalities (including the relatively small Theewaterskloof) have established linkages with sources of income and knowledge at a variety of scales, particularly the international level.

National legislation and policy is important in establishing formal mandates, financing mechanisms and the framework for a more cohesive and integrated South African effort based on recognising that many climate risks and impacts (like e.g. water scarcity, coastal flooding, food insecurity, disaster-induced migration) occur across municipal boundaries. However, there is not yet a clear political currency linked to climate change within the national government or the ruling ANC. Whilst the opposition Democratic Alliance, which governs Cape Town, Theewaterskloof and the Western Cape Province, does not hold climate change as a central political issue either, there is a sense in which the climate change and environmental programmes in Cape Town and Theewaterskloof suit the party's broader effort to differentiate itself from the ruling party and forge international identities independently of national government. This political agenda has the potential to bring sustainability issues, including climate change, into the municipal mainstream. There is, however, still a long way to go in both widening and deepening these engagements, currently occurring mostly among the market-oriented elite, to tackle difficult questions regarding the future of the city-region and public spending priorities with a diversity of constituencies, including the most vulnerable to climate impacts, many of whom remain politically and economically marginalised.

5.6. Sector-driven climate change adaptation

Climate change adaptation has been driven at the sectoral level, rather than at the strategic management or political levels, both in Durban and Cape Town. Both cities have produced sector-based climate adaptation plans (MAPs and CAPAs). In Durban the engineering and water sectors are considered to contain climate change champions who align themselves with EPCPD's position. EPCPD staff have worked with them closely to embed climate change adaptation thinking and principles in their daily work. These sectors are science based and have senior managers or champions that are engineers. The EPCPD has been selective and limited about which sectors to work with, and has deliberately sought out individual 'champions' in those departments, requiring people to engage across their operational silos through innovative projects. Only once a start has been made and some short-term

success has been achieved, will EPCPD seek to institutionalise these programmes more widely across the municipality.

Cape Town has gone for a more comprehensive approach. In addition to the sectors of health, disaster management and water, Cape Town's set of climate adaptation plans has been extended to also include the sectors of coastal management, catchments and stormwater, housing, biodiversity, transport and economic development. The City's environment department has worked to identify willing counterparts in the relevant departments and sectors, working with them and technical experts to assess climate risks and impacts to their operations and plan adaptation measures. However, ERMD have faced similar challenges to eThekwini Municipality in terms of some departments either not having the capacity or the willingness to consider the implications of climate change for their practices and the services they are mandated to deliver, choosing rather to focus on their existing internal priorities and targets.

Durban's approach of working through selective champions has made coordination easier and appears to have allowed it to progress more quickly than Cape Town's attempts at being systemic. It may be, however, that Cape Town's approach of creating institutional capacity, rather than individual capacity, proves more robust and durable over the long term. One of the key challenges with taking a sector-based approach is assessing and keeping track of how well the city as a whole is adapting and how climate resilient the municipality is on aggregate in order to make strategic policy and budgeting decisions.

5.7. Leadership and the importance of climate change champions

Leadership appears to be essential in the process of climate change adaptation, but it can emerge from different sources, both internal and external to the municipality. Building capacity of local government officials to mainstream climate change concerns requires the support and effort of strong climate change champions. Led by Dr Debra Roberts, who crucially had the trust of the previous Municipal Manager and the Mayor, eThekwini Municipality has been able to champion certain concepts and programmes and link local priorities to international interests. Key to this has been the ability of technical champions to lobby for and obtain personal support amongst the municipal political leadership, which was relatively stable for 10 years prior to 2012. As a policy development leader within the municipality, Debra Roberts

has operated at a strategic level, unusual for a departmental head. Having a global leader in local-level climate protection has been a major factor in the evolution of eThekwini Municipality's climate adaptation and mitigation programmes and institutional capacity.

Progress made on addressing climate change in the City of Cape Town has also relied on strong leadership within the administration of the municipality. This has mainly been provided by a number of senior officials in the Environment Resource Management Department, who have seen the need for going beyond their prescribed mandates and have been willing and able to leverage sufficient resources and support needed do so. The University of Cape Town has provided thought leaders operating in the fields of climate change and urban sustainability, who have played a key role in getting climate change onto the local agenda and building the knowledge base required to plan interventions. Political leadership on the climate change issue has been largely lacking to date.

In Theewaterskloof a well-capacitated and close-knit leadership group of roughly 15 local business leaders, politicians and municipal officials was convened under the DBSA programme to advance the Vision 2030 programme. This group of individuals has been critical to the municipality's success in giving the sustainability agenda legitimacy, none more so than the group's convenor Jacqui Boulle.

Funding partners have a critical role to play in fostering such leadership, providing support for experimentation, innovation and networking opportunities, as well as drawing out lessons to share with others who are striving towards similar goals.

5.8. Institutional location from which climate adaptation is championed

Historically, environmental management functions have not been strategically located within municipal institutional structures. With small budgets, minimal primary powers and functions and a mandate seen as marginal to the core work of the municipality, environment departments are constrained in their ability to drive the kind of policy and institutional change that an integrated, citywide response to climate change requires. They have to gain and maintain hard-won support from many other departments (competing for budget to fulfil their mandate) and senior levels of management to get proposals considered by the political bodies of the Council. This is particularly true in the cases of Durban and Cape Town. Some

climate change champions indicate a perceived need to elevate the climate change agenda to the Office of the City Manager, as a central position from which to integrate it into the relevant directorates and departments. This parallels decisions taken in some national governments, for example Tanzania and Nepal, where a climate change function has been established in the Office of the President / Prime Minister.

Theewaterskloof, in contrast to Durban and Cape Town, placed its sustainability environmental efforts under the aegis of a 'green economy', thereby giving it greater traction within the more familiar municipal concept of local economic development (LED). This is more of a requirement in local peri-urban and rural municipalities, many of which have a single environmental officer to fulfil all environmental compliance requirements, with little or no capacity to go beyond this function.

5.9. Climate change adaptation as learning by doing

The research has revealed that climate change adaptation is still in the early stages of taking shape in all three of the municipalities. In the absence of local mandates, standards and best practice models to follow, climate change leaders in municipalities have largely had to generate strategies, approaches and practices internally through experimentation and innovation, working in the uncertain terrain of what future projected climate change impacts will materialise, but with clear evidence of existing climate impacts. All three municipalities in this study have engaged external expertise for research and training to facilitate climate change adaptation planning and prioritization, drawing on local expertise as well as on international thinking and best practices.

While progress and learning has occurred in all three places, longer temporal scales are required to assess and evaluate the outcomes of these planning efforts and experimental interventions. However, to date, there are insufficient systems in place to track progress in implementation, to effectively monitor and meaningfully evaluate whether climate change adaptation is working to reduce climate risks and vulnerabilities sufficiently across various sectors, areas and communities (*i.e.* building the evidence base to robustly address questions of impact, equity and value for money spent). Currently, such assessments are made informally and some learning is shared within the municipalities, and to a lesser extent between municipalities. More resources and expertise are required to formalise and institutionalise these processes of tracking and evaluating adaptation measures in ways that are

productive and capacitating, rather than simply an administrative burden. A more systematic approach would make it possible to draw lessons that can then be applied to refining and redirecting adaptation programmes and shared more easily, regularly and widely within and between municipalities, as well as with residents, governance partners, funders and higher levels of government.

5.10. Knowledge needs for adaptation

Knowledge partners are crucial in conceptualising and planning climate change adaptation at the local level. Each of the three municipalities have commissioned and actively made use of research and ongoing relationships with consultants and academics at local universities, as well as internationally, to design and gain scientific legitimacy for their respective programmes, relying heavily on consultants to research the nature and extent of local climate change problems and the range of possible options to address them. This new knowledge is captured in reports, however access to and uptake of this new knowledge by municipal officials and councillors is often very limited. Local meetings and seminars addressing climate change, as well as national and international climate change conferences and events, have provided important opportunities to share key questions and new knowledge generated through scientific research and operational practice. However, new forms of knowledge production are required that better institutionalise the findings and additional capacity generated during studies commissioned by the municipalities. This is an area of innovation currently being engaged in Cape Town through a formal partnership between the City and the University of Cape Town, which sees the exchange of staff between the two organisations, for prolonged periods of time, to address research and policy questions of common relevance and share new knowledge in a timely manner and suitable format. This partnership effectively connects, in new ways, the City as a rich store of data and experiential knowledge with the University as a rich store of analytical skills and theoretical knowledge. There are many dimensions of local climate change adaptation that still require extensive research, from understanding local climate forcings and impact pathways to developing methodologies for robust decision-making on the selection and sequencing of adaptation options. Despite these three municipalities having relatively good (although still partial) data to work with and high levels of research capacity to draw on, as compared with most other municipalities in South Africa, there is still a dearth of data for tackling many of the critical questions relating to local climate change adaptation. Substantially more investment is needed in monitoring networks, observation capacity and training in the analytical skills required to make use of such data resources.

Conclusion

FOCALES

Conclusion

This research has focussed on identifying the institutional, political and social factors that are shaping climate change programmes in three South African local municipalities: Cape Town, Durban and Theewaterskloof. The findings indicate that concern over the threat of long-term climate change impacts on the development trajectory and sustainability of the city and municipality, and the commitment to instituting programmes and policy reforms aimed at reducing climate risks, is still largely limited to the environment sector. This is particularly true in the two larger municipalities in this study, suggesting integration across sectors may be easier in smaller municipalities or where one economic sector is particularly dominant.

While climate change is an increasing feature of public rhetoric in all three municipalities, in practice it continues to be perceived as distinct from economic growth and the provision of public services, and of lesser priority than these core local government responsibilities. In part, this is due to the conflation between political parties and government in South Africa and the perception that there is currently little political currency in tackling long-term climate risks. As a result, climate change adaptation efforts tend not to feature as a systemic element of municipal planning and budgeting. The financing and funding that has made it possible for municipalities in this study to initiate processes of climate adaptation came from external sources, in all three cases.

Adept officials willing to push the boundaries of their mandate and motivated to introduce new items onto the municipal agenda, with a resolve to learn by doing, was a feature common to the success of the three municipalities. In each case, there were people willing to begin a process of adapting despite uncertainty and a distinct lack of guidance and recognised best practice, either from other municipalities, national government or international networks. In all three cases, these leaders have been people in a technical role, rather than political leaders. It is evident that strong technical leadership is necessary but it is not sufficient for widespread uptake of climate change adaptation as a municipal priority. As a result of this technical, rather than political, orientation to the issue of climate change, there has as yet been very limited engagement by the municipalities with civil society groups on questions of what levels of climate risk are acceptable, what risk reduction measures are deemed

preferable, and what level of public spending on addressing climate risks is justifiable. This is a critical area for funding and research support.

The study reveals that adaptation progress to date has been reliant on coupling the climate change agenda with a dominant, pre-existing local development priority, such as market competitiveness, job creation or water security. However, when the climate change agenda conflicts with a local development priority, for example making land available for property development, it is actively marginalised, suggesting that municipal adaptation planning to date is limited to building resilience within the traditional patterns of economic inequality and political marginalisation, not going as far as attempting to reconfigure socio-economic relations and political authority in any transformative sense.

Experts in the administrative, consultant and science communities continue to frame climate change adaptation in ways that align the problem and solutions with their field of knowledge and expertise. This has led to progress on specialist fronts, but has undermined holistic analyses of the political, social and institutional origins of the phenomenon and inhibited more systemic solutions. It is clear that a combination of more and better scientific knowledge and experiential knowledge is required to understand the local nature and extent of climate-related changes, to design workable local solutions and to embed them in the network of organisations that shape the future of the city. Producing such new knowledge demands extensive resources that are hard to come by, even in the best resourced municipalities. Assimilating and acting upon such knowledge, beyond the municipal officials directly involved in commissioning targeted research, requires new forums to be established and legitimised. Building the institutional legitimacy of such collaborative spaces is particularly difficult and time-consuming, requiring considerable investment in emergent, rather than prescribed, outcomes. Consequently, all three municipalities studied are still in the early stages of adaptation, working to understand the problem, building networks across key departments and external partners, and identifying and assessing options.

While there is discernible progress in setting up new partnerships and charting a new course of action in light of increasing climate risks, there remains very little in the way of implementation in terms of changing the types of services the municipality provides, the way such services are provided, the promulgation of new regulations and the imposition of sanctions on those who contravene them. In this regard, more research is needed into the costs and the financing options for implementing municipal adaptation measures that have been identified. This is particularly true in

light of perceived restrictions imposed by legislation governing municipal financial management, which limits the nature and duration of public-private partnerships and restricts the build-up of financial reserves for dealing with future large-scale climate impacts.

More emphasis needs to be placed on prioritising and sequencing adaptation options, within and between local government sectors, in a way that accounts for technical considerations, political and economic priorities, as well as capacity constraints. These adaptations have to be implemented in such a way that the core functioning of the municipality is maintained while experimenting with new service models, technologies and modes of partnership. Climate change adaptation requires long-term planning and forward-looking decision-making that marries scientific diagnoses and technical innovation with social organisation and political debate around competing value systems. It requires building in experimentation, iterative learning and the capacity to shift practices and policy positions in light of new findings. New kinds of partnerships, including funding partnerships, are required to make this possible.

Finally, reflecting on the methodology of this study, it proved useful to include a seemingly dissimilar case (Theewaterskloof) as a point of comparison and contrast. The trans-disciplinary nature of this work and the lack of well-established theoretical frameworks in this field of research, combined with the very recent emergence of climate adaptation as a practice, make this type of research challenging but necessary. More such research is needed to better understand and advise on how marginal, niche climate adaptation measures, in both the public and private spheres, might be replicated, scaled out and linked up to generate the kinds of systemic transformation that could make whole cities resilient to the shifting patterns of the local and global climate.

Appendices

FOCALES

Appendices

Appendix A: List of interviewees in each case study

Municipality	Person interviewed	Organisation
Cape Town	Belinda Walker	City Councillor: Mayoral Committee Member for Economic, Environmental and Spatial Planning
Cape Town	Garreth Bloor	City Councillor: Economic, Environmental and Spatial Planning Portfolio Committee
Cape Town	Osman Asmal	City of Cape Town, Environmental Resource Management Department
Cape Town	Gregg Oelofse	City of Cape Town, Environmental Resource Management Department
Cape Town	Sarah Ward	City of Cape Town, Environmental Resource Management Department
Cape Town	Stephen Granger	City of Cape Town, Environmental Resource Management Department
Cape Town	Amy Davidson	City of Cape Town, Environmental Resource Management Department
Cape Town	Darryl Colenbrander	City of Cape Town, Environmental Resource Management Department
Cape Town	Patricia Holmes	City of Cape Town, Environmental Resource Management Department
Cape Town	Clifford Dorse	City of Cape Town, Environmental Resource Management Department
Cape Town	Penny Price	Western Cape Provincial Government
Cape Town	Lucinda Fairhurst	ICLEI – Local Governments for Sustainability
Cape Town	Greg Pillay	City of Cape Town, Disaster Risk Management Centre

Municipality	Person interviewed	Organisation
Cape Town	Chris Konings	City of Cape Town, Disaster Risk Management Centre
Cape Town	Charlotte Powell	City of Cape Town, Disaster Risk Management Centre
Cape Town	Barry Coetzee	City of Cape Town, Utility Services
Cape Town	Catherine Stone	City of Cape Town, Spatial Planning and Urban Design Department
Cape Town	Adele McCann	City of Cape Town, Spatial Planning and Urban Design Department
Cape Town	Schalk De Jager	City of Cape Town, Planning and Building Development Management Department
Cape Town	Rod Arnold	City of Cape Town, Roads and Stormwater Department
Cape Town	Niki Covary	City of Cape Town, Transport Department
Cape Town	Matthew Moody	City of Cape Town, Transport Department
Cape Town	Peter Flower	City of Cape Town, Water and Sanitation Department
Cape Town	Ian Gildenhuys	City of Cape Town, Specialised Health Services
Cape Town	Susan Mosdell	City of Cape Town, Legal Services Department
Cape Town	Carol Wright	City of Cape Town, Strategic Development Information and GIS Department
Cape Town	Natasha Primo	City of Cape Town, Strategic Development Information and GIS Department
Durban	Debra Roberts	eThekwini Environmental Planning and Climate Protection Department
Durban	Nicci Diedrichs	Ecofutures
Durban	Mary Galvin	Umphilo waManzi
Durban	Bryan Ashe	KZN Cordinator at GeaSphere in KZN on Water and Climate Change Issues
Durban	Neil Macleod	eThekwini Water and Sanitation Unit
Durban	Bill Pfaff	eThekwini Water and Sanitation Unit

Municipality	Person interviewed	Organisation
Durban	Geoff Tooley	eThekwini Stormwater and Catchment Management
Durban	Rob Dyer	eThekwini Water and Sanitation Unit
Durban	Andrew Mather	eThekwini Coastal Policy
Theewaterskloof	Alastair Moodie	Melsetter Group
Theewaterskloof	Alison Green & Barry Gould	Barry Gould Architect and Green Mountain Eco Route
Theewaterskloof	Annelie Rossouw	Grabouw Sustainble Development Institute
Theewaterskloof	Ben Schoeman	Development Bank of South Africa
Theewaterskloof	Brenda Martin	Project 90x2030
Theewaterskloof	David Farrel Eddie Vienings	Colors (Pty) LTD
Theewaterskloof	Dion Wilmans	Genesyswind
Theewaterskloof	Dr Paul Cluver	Capespan/ Paul Cluver Wines/ University of Stellenbosch
Theewaterskloof	Francois Rozon Kobus Prins Brendan Jales	Appletiser
Theewaterskloof	Inga Kotze	WWF (Newlands)
Theewaterskloof	Ivan Turok	Human Sciences Research Council
Theewaterskloof	Jacqui Boulle	Independent advisor to TWK
Theewaterskloof	Jan Visagie Conrad van Heerden	TWK Municipality
Theewaterskloof	John Stenslunde; Tony Cole	SAB Maltings
Theewaterskloof	Prof. Mark Swilling	Sustainability Institute, Stellenbosch University
Theewaterskloof	Mark Tanton	SA Wind Energy Association
Theewaterskloof	Peter Dall	Farmer, consultant
Theewaterskloof	Prof. Nic Segal Juanique Pretorius	Independent Consultant, Emeritus Prof. Graduate School of Business
Theewaterskloof	Rudi Coetzee	Operations Manager. Caledon Spa and Casino, Tsogo Sun

Appendix B: List of adaptation actions contained in the City of Cape Town's seven completed Climate Adaptation Plans of Action

Sector	Measures
Catchment, River & Stormwater Management	Develop metro-wide computer models of stormwater systems (including natural water courses) for assessing runoff and floodlines
	Model the flood risk associated with the interaction between freshwater flooding and storm surge / sea level rise to assess impact on flood levels at coastal river mouths
	Revise design of stormwater and river systems to allow for climate change, specific changes in rainfall
	Develop predictions of impacts of climate change and sea level rise on groundwater levels and salt water intrusion
	Revised floodlines along inland watercourses and coastal estuaries and extend management of development to these new floodplains (i.e. existing Floodplain Management Policy to be applied to new developments within revised floodlines; advise affected households of increased flood risk; protect or critical infrastructure or relocate to areas with reduced risk)
	Check adequacy of existing stormwater infrastructure under predicted climate change impacts and assess various adaptation options for implementation including: retrofitting of sustainable urban drainage systems (SUDS) in existing developments increasing capacities of inadequate systems such as detention storage or pipe flow capacities; advise affected households of increased risk; protect critical infrastructure or relocate to areas with reduced risk
	Implement water sensitive urban design (WSUD) principles in all new developments; Established buffers are along rivers or around wetlands that are located adjacent to new developments
	Encourage formation of multi-stakeholder partnerships to facilitate rehabilitation of rivers and wetlands since intact and well-functioning river and wetland ecosystems are more likely to be resilient to climate change impacts
	Develop stormwater-related adaptation measures to reduce impacts of climate change and sea level rise on groundwater resources *e.g.* use of stormwater runoff for groundwater recharge to counter saltwater intrusion
	Reduce flood risk of informal communities by: relocation of informal households found to be subject to increased flood risk; provision of adequate stormwater systems if the informal settlement area to be upgraded
	Inform communities about increased water quality risk resulting from climate change, as well as responsibilities w.r.t pollution prevention
	Adapt operation and maintenance programmes to suit changing climate conditions, e.g. prepare stormwater system for earlier onset of winter rains, increased focus on litter and sediment removal for stormwater system, etc.

Sector	Measures
Coastal	Designate Coastal Protection Zone
	Develop Coastal Protection Zone regulatory mechanism
	Develop Sea Level Rise and Storm Surge Hazard Policy
	Develop City Decision Support Tool for coastal development and investment decisions
	Develop Climate Change Policy
	Develop adaptation and mitigation measures case by case
Disaster Management	Conduct city-wide Disaster Risk Assessment (DRA) to inform Integrated city-wide Disaster Risk Management Plans for the identified hazards
	Identify and map areas of high risk & vulnerability to: heat stress; flooding; coastal inundation; high wind speeds (and any other climate change hazards)
	Identify strategies to reduce the risk in highest risk areas
	Develop and implement early warning systems so that residents of Cape Town are informed timeously of climate change related hazards, especially: Fire Risk Heat Waves High UV; Extreme rainfall; Extreme wind; Storm surges; Cold snaps; Flooding
	Prepare an advance response strategy to early warnings and incorporate into DRM Plans and Departmental SOPs
	Monitor other hazard occurrences (those not covered by EWS) and activate response strategies as required
	Regularly assess climate-sensitivity of emergency response arrangements (*e.g.* access routes, communications, location of emergency shelters)
	Communicate climate change risk reduction plans and strategies and all departmental roles and responsibilities within the City
	Training programme for DRMC and other City staff on climate change hazards and risks
	Run education and awareness-raising programmes city-wide on early warnings, preparedness and responses to reduce vulnerability and increase resilience (with focus on youth)
Health	Ensure robust City Health Care facilities that can continue to provide health care services under changing and / or extreme climatic conditions; begin by identifying which City Health clinics are under threat from flooding, sea level rise, storm surges, wind damage
	In partnership with the City's Corporate Services Department and Disaster Risk Management Centre, ensure continuity of the provision of health care services under changing and or extreme climatic conditions associated with climate change; the plan needs to cover cold chain management, emergency water, electricity supply, alternative facilities, alternative transport routes to clinics

Sector	Measures
Health	City Health to foster ongoing bilateral relationship with Province around rendering effective public health service under changing and or extreme climatic conditions; put in place a Service level agreement between Provincial Health department & City Health regarding the provision of clinic services by City Health
	Ensure City Health facilities have capacity to deal with an increased number of cases of climate-related health conditions (including heat stroke, dehydration, burns and smoke inhalation, water-borne diseases, diarrhoea, respiratory tract agitation due to poor air quality)
	Ensure ongoing access to and promotion of immunisation programmes, with a focus on current and future threats
	Monitor and manage the incidence and spread of climate-related water-borne disease vectors, working with City departments, Scientific Services, Catchment, River and Stormwater Management and Sports and Recreation
	Develop and implement sustainable health promotion education, communication and community-based campaigns to increase awareness of climate-related health impacts and how to mitigate these effects
	Identify and encourage external funding sources, supplementing internal training budgets, to ensure ongoing capacity for education
	Approach and encourage academic and research institutions to research the inter-relationships between air quality and climate change and the likely impacts of extreme events (including the mortality and morbidity rates associated with a drought or heat waves)
	Streamline the City's research application process where patient records or engagement are not required in order to make City generated data more accessible for research purposes
	Monitor changes in distribution and occurrence of vector-borne, water-borne, air-borne and food-borne diseases e.g. malaria and dengue fever, dysentery, legionnaires disease, SARS, etc.
	Leverage more budget to maintain and expand the ambient air quality monitoring network in order to monitor changes in ambient air quality status and profile linked to climate change
Housing	Ensure climate change considerations are taken into account in City's low-cost housing programme and land identification
	Review low-cost housing designs and selection of materials with projected climate changes in mind; research design options that increase the resilience to climate change
	Research sustainable funding mechanisms for 'climate proofing' large scale low-cost housing roll-out.

Sector	Measures
Housing	Examine mechanisms for the top-up funding required to increase climate resilience of low-cost housing
	Request climate change training programme for the housing department to consider climate in their day-to-day activities and ensure a commitment to implementation
	Provide consumer education, include climate considerations with new and existing homeowners and rental stock tenants
Planning	Ongoing research to ensure City is abreast of advancements in climate science and knowledge on functional ecosystem services in Cape Town and the spatial implications of these to inform the development and/or review of plans and planning policies
	Factor climate change risks into City Spatial Development Framework, integrated District Spatial Development Plans and Environmental Management Frameworks and local area plans and policies to increase City resilience and protect key City ecosystem services
	Develop City wide policy with guidelines / criteria for resource-efficient development
Water & Sanitation	Model future water supply in the face of projected climate changes; include further detail into existing climate change scenarios modelled in the WCWS Reconciliation Strategy
	Complete feasibility studies that consider alternative water resources to surface water supply (e.g. desalination, groundwater, water reclamation)
	Consider alternative surface water supplies
	Monitor rainfall data continue with baseline data collection to determine any changes to rainfall patterns such that changes are detected early and adaptation measures can be implemented as soon as possible
	Ensure continued drought response plan taking into account climate change projections (drought response for operation of the WCWSS is conducted co-operatively between CCT and DWA, through ongoing system modelling and assessing need for, and implementing water restrictions)
	Monitor groundwater recharge rates; continue with baseline data collection to determine any changes to aquifer recharge rates and water quality
	Consider predicted climate changes and ensure that all new bulk water infrastructures are located out of high-risk areas (esp. flooding and SLR) or are appropriately protected
	Ensure that climate change specs are incorporated into all new bulk water, stormwater, wastewater & sanitation infrastructure where practical, *e.g.* dam spillways to accommodate more intense flooding
	Improve design and maintenance of bulk water supply systems to accommodate expected increase in evaporation rates

Sector	Measures
Water & Sanitation	Conduct a climate change risk assessment of all existing sanitation related infrastructure; plan the relocation of infrastructure currently at risk; infrastructure that cannot be relocated for economic or infrastructure reasons should be evaluated for protection measures
	Evaluate alternative wastewater treatment systems for sludge handling
	Ensure water quality standards in bulk water supply and waste water systems comply in the face of climate changes; monitor water quality in order to detect any changes in algal strains present; monitor effectiveness of water purification techniques and methods under increases in water temperature
	Improve the efficiency of water use in residential and commercial development by changing consumer behaviour; build an element on climate change into the Water Saving Campaign
	Promote and encourage the implementation of water-sensitive urban designs through effective communication and education programmes

List of acronyms

List of acronyms

ACC	African Centre for Cities
ANC	African National Congress
AsgiSA	Accelerated and Shared Growth Initiative for South Africa
CAPA	Climate Adaptation Plan of Action
CCP	Cities for Climate Protection campaign
CEBA	Community Ecosystem Based Adaptation
CDM	Clean Development Mechanism
CO_2	Carbon Dioxide
COGTA	Department of Co-operative Governance and Traditional Affairs
COP17	17th Conference of Parties to the UNFCCC
CSCT	Climate Smart Cape Town campaign
CSIR	Council for Scientific and Industrial Research
CTSDF	Cape Town Spatial Development Framework
Danida	Danish Development Agency
DA	Democratic Alliance
DBSA	Development Bank of South Africa
DCCP	Durban Climate Change Partnership
DEA	Department for Environmental Affairs
D'MOSS	Durban Metropolitan Open Space System
DRM	Disaster Risk Management
DRMC	Disaster Risk Management Centre
ECAP	Energy and Climate Action Plan
EPCPD	Environmental Planning and Climate Protection Department
ERMD	Environmental Resources Management Department
EWS	EThekwini Water and Sanitation Unit
FAC4T	Framework for Adaptation to Climate Change in the City of Cape Town
GCM	General Circulation Model

GDP	Gross Domestic Product
GEAR	Growth, Employment and Redistribution Strategy
GHG	Greenhouse Gases
GIS	Geographical Information System
GWUA	Groenland Water User Association
HCCAS	Headline Climate Change Adaptation Strategy
IDP	Integrated Development Plan
ICLEI	Local Governments for Sustainability
IGCCC	Intergovernmental Committee on Climate Change
IMEP	Integrated Metropolitan Environmental Policy
IPCC	Intergovernmental Panel on Climate Change
MAP	Municipal Adaptation Plan
MCPP	Municipal Climate Protection Programme
MFMA	Municipal Finance Management Act
NCCR	National Climate Change Response White Paper
NDP	National Development Plan
Nedlac	National Economic Development and Labour Council
NEMA	National Environmental Management Act
NGO	Non-Governmental Organisation
NGP	New Growth Path
NSSD	National Strategy for Sustainable Development
OECD	Organisation for Economic Co-operation and Development
PPP	Public–Private Partnership
RDP	Reconstruction and Development Programme
SAB	South African Breweries
SACN	South African Cities Network
SALGA	South African Local Government Association
SANBI	South African National Botanical Institute
SEED	Sustainable Energy for Environment and Development
SLR	Sea-level Rise
UCT	University of Cape Town
UEM	Urban Environmental Management programme

UKZN	University of KwaZulu Natal
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
USAID	Unites States Agency for International Development
WWF	World Wildlife Fund

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The African Centre for Cities (ACC) is dedicated to "figuring out cities", on their own terms, with the intent of understanding how more and better opportunities for human flourishing and ecological care can be created. Institutionally, ACC operates as an interdisciplinary research and teaching programme at the University of Cape Town, South Africa, focussed on critical scholarship regarding the dynamics of urbanisation processes in Africa and the global South.

ACC thrives on being a new generation knowledge institution rooted at an African university. This identity compels us to refuse false choices between theory and practice, practice and policy, ivory tower versus the street, expert versus lay knowledge, or formal versus informal. Instead, we insist that cities are profoundly intriguing, inspirational and tough places where societies and economies find their identity and place in the world. This makes all cities both complex and ordinary: places not just to be rediscovered but also to be continuously reinvented.

The mission of the ACC is to conduct collaborative research and contribute to imaginative policy discourses and practices to promote vibrant, just and sustainable cities. This mission is based on a commitment to vital ethical principles: social justice, radical democracy, cosmopolitanism (i.e. the right to cultural pluralism and tolerance) and ecological integrity. These principles underpin our approach to knowledge co-production, partnerships, learning and intervention. This sensibility enables innovation in tough contexts, often equally marked by despair and promise.

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Institutional Pathways for Local Climate Adaptation:
A Comparison of Three South African Municipalities

Globally, many local authorities have begun developing programmes of climate change adaptation to curb existing and expected local climate impacts. Rather than being a one-off, sector-specific technical fix, effective adaptation is increasingly recognised as a process of socio-institutional learning and change. While notions of governance are coming to the fore in climate change adaptation literature, the influence of local political and bureaucratic forces is not well documented or understood, particularly in developing country contexts.

This research focuses on the political, institutional and social factors shaping the initiation of climate adaptation in three South African municipalities – Cape Town, Durban and Theewaterskloof – considered local leaders in addressing climate concerns. The findings show that, with little political or fiscal support, climate change adaptation currently remains in the realm of technical planning and management, where progress is contingent on the energy, efforts and agency of individuals. There is, however, some evidence that the efforts of local champions, in concert with rising global awareness of climate change and increasing impacts on the poor and the rich alike, are beginning to create a political opportunity to make climate change a central development issue, linked to public services, markets and employment.

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