BARRIERS TO AND ENABLERS OF CLIMATE CHANGE ADAPTATION IN FOUR SOUTH AFRICAN MUNICIPALITIES, AND IMPLICATIONS FOR COMMUNITY BASED ADAPTATION

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ABSTRACT

The focus of this study is on understanding the multiple and interacting factors that hinder or enable municipal planned climate change adaptation, here called barriers and enablers respectively, and their implications for community based adaptation. To do this I developed a conceptual framework of barriers to and enablers of planned climate change adaptation, which informed a systematic literature review of barriers to planned community based adaptation in developing countries. In this framework barriers were grouped into resource, social and physical barriers. I then conducted empirical case study analysis using qualitative research methods in four South African municipalities to understand what barriers and enablers manifested in these contexts. In light of the reflexive nature of my methodology, my framework was adjusted based on my empirical findings, where contextual barriers were found to better represent the empirical results and subsumed physical barriers. I found my framework useful for analysis, but in the empirical cases, barriers and enablers overlaid and interacted so significantly that in reality it was often difficult to separate them. A key finding was that enablers tended to be more about the way things are done, as opposed to direct opposites of barriers.

Comparison of barriers and enablers across the case studies revealed a number of key themes. Municipalities struggle to implement climate change adaptation and community based adaptation within contexts of significant social, economic and ecological challenges. These contextual barriers, when combined with certain cognitive barriers, lead to reactive responses. Existing municipal systems and structures make it difficult to enable climate change adaptation, which is inherently cross-sectoral and messy, and especially community based adaptation that is bottom-up and participatory. Lack of locally applicable knowledge, funding and human resources were found to be significant resource barriers, and were often underlain by social barriers relating to perceptions, norms, discourses and governance challenges. Enablers of engaged officials, operating within enabling organisational environments and drawing on partnerships and networks, were able to overcome or circumvent these barriers. When these enablers coincided with windows of opportunity that increased the prioritisation of climate change within the municipality, projects with ancillary benefits were often implemented.

Analysis of the barriers and enablers identified in the literature and case studies, informed discussion on whether municipalities are able to implement community based adaptation as defined in the literature, as well as the development of recommendations for how municipal planned climate change adaptation and community based adaptation can be further understood and enabled in the future. These recommendations for practice and research include: (a) To acknowledge and understand the conceptual framings of municipal climate change work, as these framings inform the climate change agenda that is pursued, and hence what municipal climate change adaptation work is done and how it was done. (b) The need for further research into the social barriers that influence the vital enablers of engaged officials, enabling organisational environments, and partnerships and networks. (c) To learn from pilot community-level interventions that have been implemented by municipalities, as well as from other disciplines and municipalities. (d) To develop top-down/bottom-up approaches to enable municipal planned climate change adaptation and community based adaptation, that benefits from high level support and guidance, as well as local level flexibility and learning-by-doing. (e) To develop viable mechanisms for municipalities to better engage with the communities they serve.

DECLARATION

I, **Meggan Hazel Spires** hereby declare that this thesis is my own original work. It has not been submitted for any degree or examination at any other University, and that the sources I have used have been fully acknowledged and referenced. This thesis is submitted for the Degree of Doctor of Philosophy (PhD) at Rhodes University, South Africa.

Signature _____

Date_____

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I dedicate this thesis to Pops.

PART I: INTRODUCTION AND CONTEXTUALISATION

CHAPTER 1: INTRODUCTION

1.1. INTRODUCTION AND OVERVIEW OF CHAPTER

This introductory chapter provides the motivation for this study, describes the broad philosophical underpinnings of the work, discusses what inspired the questions I seek to explore, and documents this study's objectives. It also provides a roadmap for my thesis by outlining the research process and thesis structure. This chapter answers the 'so what' question of why this research is important, and provides the rationale, logic and structure needed for you, the reader, to follow the journey of my research with relative ease.

1.2. CLIMATE CHANGE ADAPTATION, LOCAL GOVERNMENT AND BARRIERS

> *Climate change is serious, it is urgent, and it is growing. Our generation's response to this challenge will be judged by history, for if we fail to meet it -- boldly, swiftly, and together -- we risk consigning future generations to an irreversible catastrophe* (Obama, 2009, para. 1).

Climate change (CC), one of the greatest challenges of our time (Betsill & Bulkeley, 2006; Duff, 2011; United Nations Framework Convention on Climate Change [UNFCCC], 2009), is upon us. This phenomenon could change the planet's future irreversibly if not dealt with effectively. To date, the majority of CC funding has focused on mitigation (Sabelli & Spensley, 2012; World Bank, 2010), *"a human intervention to reduce the sources or enhance the sinks of greenhouse gases"* (Intergovernmental Panel on Climate Chang [IPCC], 2014, p. 19), versus adaptation, *"the process of adjustment to actual or expected climate and its effects[1]"* (IPCC, 2014, p.1). Climate change adaptation (CCA) is of vital importance, as regardless of mitigation progress, the earth is committed to future warming (Duff, 2011), which is likely to exceed 2°C (Berrang-Ford, Ford, & Paterson, 2011). Hence, *"adaptation is unavoidable"* (Berrang-Ford et al., 2011, p. 1; Klein et al., 2007, p. 747), and therefore research on adaptation is of vital importance (Adger, 1999). The case for CCA is even stronger for developing countries (Eakin, Lemos, & Nelson, 2014; Mertz, Halsnæs, Olesen, & Rasmussen, 2009; Roberts, 2013; UNFCCC, 2006), which house most of the world's poorest and most vulnerable[2] communities. It is the poor, who live in closest relationship with the environment, who will be most affected by CC, but have done the least to cause it (Duff, 2011; IPCC, 2001).

[1] *"In human systems, adaptation seeks to moderate harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate and its effects"* (IPCC, 2014, p. 1).
[2] Vulnerability is defined as the *"propensity or predisposition to be adversely affected"* (IPCC, 2014, p. 28).

It is at the community level that CC impacts are most significantly felt (Reid et al., 2009). These CC impacts overlay existing socio-economic challenges like market volatility, political instability (Eakin et al., 2014), unemployment, housing shortages, HIV/Aids, illiteracy, food insecurity, and high poverty levels (Madzwamuse, 2014). Ecological challenges such as environmental degradation, soil erosion and biodiversity loss, also interact with CC impacts and socio-economic challenges. Assisting communities in adapting to these changes and stressors is therefore essential. Community Based Adaptation (CBA) is the field of work that has been developed in response to the aforementioned acknowledgement that CC impacts manifest at the community level, and that it is the poor who are the most vulnerable to CC. It aims to respond to the impacts of CC by improving the adaptive capacity[3] of communities and by empowering communities to lead the changes and improvements required. CBA interventions are based on community priorities, needs, knowledge and capacity (Reid et al., 2009), with local indigenous knowledge being valued, both due to its relevancy and validity (Berman & Kofinas, 2004; Orlove, Chiang, & Cane, 2000; Riedlinger & Berkes, 2001). CBA is gaining traction in the CCA field as there are a number of case studies where technologies have been developed, strategies and plans promulgated, but without community buy-in, the projects have failed (Muraya, 2006; O'Hara, 2002; Thomson & Schoonmaker Freudenberger, 1997). Beyond the failure of these projects and the resource loss associated with this, there is also the real risk of mal-adaptation: adaptation that leads to an increase in community vulnerability to CC impacts (United Nations Development Programme [UNDP], 2011). Hence, CBA takes into account lessons learnt during nearly two decades of CCA research and practice (Reid & Schipper, 2014). Advocates of CBA also *"claim that it is the most effective mechanism for identifying, assisting and implementing community-based development activities, research and policy in regions where adaptive capacity is as dependent on current livelihood opportunities as climatic changes"* (Dodman & Mitlin, 2013, p. 641).

It is acknowledged that there are limits to what communities can do on their own, acting autonomously in response to CC (Conway & Mustelin, 2014; Leary et al., 2008; Peltonen, Juhola, & Schuster, 2010). There has therefore been a call for planned adaptation, whereby institutions (governmental, non-governmental and/or community-based) assist communities with the planning and implementation of adaptation actions. Government, as an organisation that seeks to serve its citizens and protect them from harm, and which operates within the realm of public good (Niggol, 2010), has an important role to play in enabling planned adaptation (at the municipal level) (Adger & Nicholson-Cole, 2011; Tompkins et al., 2009). This is especially so, because experience in adaptation

[3] *"The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences"* (IPCC, 2014, p. 2).

implementation has revealed that when the adaptation agenda is driven strongly by external agents, other than government, CC communication is often confusing and not based on context-specific priorities, countering the coordinated approaches that are essential to CCA (Conway & Mustelin, 2014). Local government (municipalities), as the government tier best able to take local context into account (Pasquini, Cowling, & Ziervogel, 2013), and which is located closest to the communities impacted by climatic changes, has an especially important role to play in adaptation that benefits local communities (Betsill & Bulkeley, 2006; Measham et al., 2011; Pasquini & Shearing, 2014; Pasquini, Ziervogel, Cowling, & Shearing, 2014; Sekine at al., 2009).

The field of barriers to adaptation, which is a growing focus in the literature (Biesbroek, Klostermann, Termeer, & Kabat, 2013; Inderberg & Eikeland, 2009), responds to the acknowledgement that there are significant constraints to adaptation (Biesbroek et al., 2013; Klein et al., 2014). Burch (2010) states that barriers to local level CC action are poorly understood, despite the influences these barriers have on the likelihood of successful CCA. Furthermore, even though there is an urgent need for adaptation in developing countries, most of the research on barriers to mainstreaming CC in municipalities has been conducted in developed countries (Pasquini et al., 2014). Biesbroek et al. (2013) found that barriers to adaptation have not been clearly defined in the literature, with no clear indication of how to identify and assess them. The IPCC (2014) has responded to this by dedicating an entire chapter within their Fifth Assessment Report (AR5) to what they call 'adaptation opportunities, constraints, and limits' (Klein et al., 2014)[4]. Their definition of constraints: *"factors that make it harder to plan and implement adaptation actions"* (Klein et al., 2014, p. 907) aligns with the definition of barriers I use in this thesis. Here, barriers are seen as obstacles that result in reduced effectiveness and efficiency of adaptation interventions, which can be overcome with concerted effort (Moser & Ekstrom, 2010), while limits are those *"obstacles that tend to be absolute"* (Moser & Ekstrom, 2010, pp. 22026-22027).

In this section, I have provided motivation for why municipal planned CCA and CBA is essential in ensuring that the world's most vulnerable communities are able to adapt to CC, and have also indicated that there are significant barriers to these interventions. Research on barriers to CCA and CBA planned by municipalities, as well as those factors that enable community-focused planned adaptation in these contexts, has received limited attention. Moreover, there is a lack of research on the factors that allow adaptation to proceed (Klein et al., 2014). These factors, called enablers in this thesis, will also be investigated during this study. Hence, my research aims to contribute to both of these research gaps.

[4] Further discussion of the IPCC's (2014) framework for assessing adaptation opportunities, constraints and limits, can be found in Section 3.3.4.

1.3. THE RESEARCH AIM AND OBJECTIVES

The research conducted in this study, was inspired during my time working for eThekwini Municipality (EM) on CCA[5]. It was during the day to day planning and implementation of CCA, that the importance of adaptation, the value of CBA and the social justice perspective (articulated in Sections 1.2 and 1.4.3 respectively), now inherent in this study, were given real world relevance and importance. Through my own experience, as well as interactions with those trying to understand, plan and implement CCA, I found that enabling adaptation in the municipal context faced significant barriers, particularly at the community scale. This inspired me to want to discover what these challenges (here called barriers) were, and investigate ways to overcome them. The questions I asked were: (a) what barriers and enablers are experienced when municipalities embark upon CCA work? and (b) how do these barriers and enablers relate to the ability of municipalities to enable planned CBA? These questions were based on my desire to improve the understanding of specific organisational problems, and develop findings with practical relevance, which aligns with Gray's (2004) definition of applied research.

The aim of my research was to identify and understand the multiple and interacting barriers to and enablers of municipal planned CCA, and the implications of these barriers and enablers for CBA. To achieve this aim, I embarked on three objectives:

1. To develop a framework for the identification of barriers to and enablers of CCA and CBA, developed further by a systematic literature of barriers to CBA in developing countries.
2. Utilising the framework developed, to identify and investigate the barriers to and enablers of CCA in four South African municipalities, and explore the implications of the findings for CBA.
3. To unpack common overarching themes in relation to the barriers and enablers identified across the four case studies, and discuss what these findings mean for practice and research in relation to municipal enabled CCA and CBA.

The development of the framework described in objective 1, was achieved by conducting a traditional review of the literature where barriers to CCA were discussed (Section 3.2), informed by the theoretical and contextual underpinnings of Chapters 1 and 2. This framework (see Section 3.4) then informed a systematic literature review of barriers to planned CBA in developing countries (Chapter 4). It also provided the basis for empirical analysis of barriers and enablers operating in four South African municipalities, for the achievement of objective 2 (Chapters 6 - 9). The third objective was achieved by drawing on both the literature and empirical analysis conducted, to uncover overarching

[5] I worked as a Specialist CC Consultant and Climate Protection Scientist at EM from February 2009 to January 2012.

themes in relation to the barriers and enablers identified, and discuss what these findings mean for municipal planned CCA and CBA (Chapters 10 and 11).

In summary, my study seeks to make a theoretical and empirical contribution to the academic literature, by drawing on an analysis of the literature and empirical case studies to further the understanding of barriers to and enablers of planned CCA and CBA within the municipal context. It also seeks to make a contribution that has practical relevance, via close interactions with practitioners consulted in this study (discussed further in Section 5.2).

1.4. THEORETICAL UNDERPINNINGS

This thesis is underpinned by the acknowledgement that adaptation occurs within complex social-ecological systems (SESs) (Section 1.4.1), which involve actors, whose behaviour is not pre-determined or directed (Section 1.4.2). These systems are unpredictable and non-linear, with emergent trends and chaotic changes occurring (Duit & Galaz, 2008). I view all this through a social justice lens, where the ethical aspects of a phenomenon that does not affect everyone equally, is paramount (Section 1.4.3).

1.4.1. Adaptation occurs within complex SESs

Human beings have been interacting with and altering ecological systems for socio-economic developmental gains since the beginning of human history (Chapin, Kofinas, & Folke, 2009). These human-induced changes, such as anthropogenic CC, are now occurring at unprecedented levels (Chapin et al., 2009), therefore more than ever research within the SES paradigm is needed. This paradigm acknowledges the interlinked relationship between human and ecological systems, which continuously modify one another through complex processes of error making, knowledge discovery and adaptation (Rammel, Stagl, & Wilfing, 2007). SES thinking brings into focus the dynamic feedback processes which exist between human and environment systems as they cope and adapt to change (Allen, 1990; Berkes et al., 2003; Norgaard, 1994 as cited in Rammel et al., 2007).

SESs thinking is vital to this study as CCA embodies the study of human and environment interactions. CCA requires an understanding of how human interactions with the environment have in the past, are now, and will in the future, shape CC impacts and outcomes (which manifest in the environment). Research within the CCA field, considers how coupled SESs will respond to interactions between CC, biophysical and socio-economic challenges, which may hinder the system's ability to adapt (Klein et al., 2014). As Moser and Ekstrom (2010, p. 22026) put it, *"adaptation involves changes in SESs in response to actual and expected impacts of CC in the context of interacting non-climatic changes".* For example, non-climatic factors, such as poorly planned infrastructural development that negatively

affects natural drainage, may exacerbate CC linked impacts such as increased rainfall intensity and contribute to flooding.

Having complex SESs thinking as a base for this thesis means that at its core, the complexity of adaptation as a process is acknowledged, and the role of scale is seen to be essential (Pereira & Ruysenaar, 2012). SESs can be seen as nested, where adaptive cycles (discussed further in Section 2.3.2.1) are connected by complex cross-scale dynamics (Holling, 2001). Governance within SESs is complex, as current issues at the local level may have global, long-term consequences, calling for governance beyond single time or spatial scales (Ostrom, 2009). Ostrom (2009) advocates for scale and level-aware thinking when dealing with complex SESs, which is essential in overcoming ignorance with regards to how a solution at one level may cause a problem at another level. She argues that no one scale represents the whole system and hence solutions must take cross-scalar issues into account. This thinking is vital to the consideration of CCA, as although it is enacted at the local or community level, acknowledgement and study of international, national and provincial influences (including barriers and enablers) is essential (Buizer, Arts, & Kok, 2011).

Research and governance within SESs, where challenges cannot be boxed as physical, social or ecological, requires new ways of doing things, such as integration across traditional disciplines to make more informed decisions and solve problems in new ways (Chapin et al., 2009). This kind of transdisciplinary work (see Section 5.2), comes with its own challenges, such as different disciplines defining and understanding the same terms in different ways, and having different ways of solving problems and conducting research (Chapin et al., 2009). Despite these difficulties, doing this kind of work is essential and urgent, as the world's life-support systems come under threat. The major problems facing society are unlikely to be solved by disciplines operating on their own. These problems include global environmental changes (that overlay socio-economic challenges), which manifest at the local level, and involve SESs interacting and being influenced by feedbacks and controls operating across multiple temporal and spatial scales (Chapin et al., 2009).

Chapin et al. (2009) discuss how controls operating at different spatial and temporal scales influence SESs. In relation to spatial influences and organisational governance (see Section 1.4.2), they assert that global and regional organisations often have more power than local organisations, and constrain what they are able to do. The local scale is able to influence levels higher up, but only when the changes made are significant, persisting over long time periods and large areas (Chapin et al., 2009). They also discuss how human agency; *"the capacity of humans to make choices that affect the system"* (Chapin et al., 2009, p. 14) and path dependency - where current dynamics are linked to both current conditions and the history of prior events - influence SESs. They argue, that human decisions and

actions that are taken today, not only manifest in shaping current conditions, but shape the future state of the system, leading to path dependency. Hence, uncertainty and limited predictability, a feature of CC, are inherent within these dynamic systems (Duit & Galaz, 2012; Holling, 2001), and present significant challenges for governance systems (Pereira & Ruysenaar, 2012).

1.4.2. Utilising a governance lens

In this thesis, I understand adaptation to be a dynamic social process (Adger, 2003), where CCA goals are defined and pursued in an interactive fashion (Ziervogel & Parnell, 2014). What adaptation is pursued and how it is pursued, depends on people and the power dynamics that exist between them (Ziervogel & Parnell, 2014), as well as the interactions between multiple actors that may have different goals/agendas. Identifying these different agendas assists in developing adaptation pathways that are able to address multiple goals (Ziervogel & Parnell, 2014). However, as indicated by Adger and Nelson (2010), these different values which are aligned with competing interests, often present significant barriers to the implementation of adaptation. Using the governance lens brings to the fore how the interactions between government and other actors, and between institutions with different levels of authority and operating at different scales (Betsill & Bulkeley, 2006), influences CCA. According to Ziervogel and Parnell (2014), utilising a governance lens means assessing: (a) knowledge: the state of knowledge and the perceived need to respond to CC; (b) action: inter-governmental coordination and leadership, and capacity to adapt; and (c) institutional barriers: policies, mandates and financial measures (see Section 3.2).

Duit and Galez (2008) indicate that when organisations govern, there is a constant trade-off between governing for exploration and governing for exploitation. Exploration aims to seek out new ways of doing things via risk-taking and experimentation, whereas exploitation aims for refinement of functions and increased task efficiency (Duit & Galez, 2008). Adaptation to CC is a relatively new function for municipalities and hence is likely to require exploration, but the loss of efficiency required to do this, often makes exploration unappealing. This is especially the case in resource-poor environments, as exploration requires good quality educational and informational systems and significant resources (both human and financial) (Duit & Galez, 2008). Organisations, such as municipalities, feed off the stability that exploitation creates, as it endorses predictability and increases the efficiency with which functions are performed. This tension between exploration and exploitation is linked to the adaptive capacity of an organisation's governance system. Robust systems have high exploration and exploitation, as they are able to deal with both slow and predictable, as well as rapid and unpredictable change within SESs (Duit & Galez, 2008). They are also able to detect

changes early, undertake flexible decision making, enable cooperative action and re-organise effectively (Duit & Galez, 2008).

1.4.3. Social justice as a motivator for CBA

Vogel et al. (2007) indicate that there are various perspectives from which vulnerability, adaptation and resilience can be viewed through the CC lens: a vulnerability perspective, a political-ecological and sustainability perspective, a social justice perspective, and a disaster risk reduction perspective. The perspective on which this thesis is built is social justice; this is because *"the challenges of CC raise fundamental questions about social justice, equity and human rights"* (Fløttm & Gjerstad, 2013, p. 13). The impacts of climate variability and change are spatially and socially differentiated (Adger, 1999; Adger, 2003; Adger & Nicholson-Cole, 2011); CC may exacerbate social inequality (Revi et al., 2014), and thus adhering to a social justice perspective in relation to CCA, leads to the prioritisation of vulnerable populations for their protection from increased harm due to CC (Adger & Nelson, 2010; Pelling, 2011). Furthermore, barriers to CCA *"have the potential to create or exacerbate inequitable consequences due to CC (very high confidence)"* (Klein et al., 2014, p. 30).

Adger (1999) makes the link between CC impacts, vulnerability, poverty and access to resources, and argues that vulnerability to CC is, in part, driven by the same issues that cause socio-economic inequality (Adger & Nicholson-Cole, 2011). Vulnerable communities have difficulty adapting for two reasons: (a) they have low adaptive capacity, while being highly exposed and sensitive to changes in their environment; and (b) they have *"limited access to public assistance and external resources"* (Adger & Nelson, 2010, p. 85). This acknowledgement has led to the promotion of pro-poor adaptation (Prowse, 2008; Moser & Satterthwaite, 2008; Tanner & Mitchell, 2008). The IPCC[6] (2014) has acknowledged the need for pro-poor adaptation to such an extent that they have dedicated a chapter in their AR5 to livelihoods and poverty (Olsson et al., 2014). In this chapter, it is indicated that due to the numerous challenges that occur within the climate-poverty-development nexus, discussion on the need for transformation of development pathways is increasing; which would include a shift from near- to long-term climate-resilient development pathways (Olsson et al., 2014). These pathways would integrate our ever-evolving understanding of CC consequences with our understanding of conventional and alternative development pathways, and bring adaptation, mitigation and development together to achieve sustainable development (Denton et al., 2014).

[6] The IPCC is an internationally acclaimed scientific body and is the leading organisation for the assessment of CC. It was established by the United Nations Environment Programme (UNEP) and World Meteorological Organisation (WMO) and provides practitioners, policy makers and academics from across the globe with a clear scientific view of CC via five yearly assessment reports (IPCC, 2012). See: www.ipcc.ch

Pro-poor adaptation, viewed through a social justice lens, is not just about assisting the most vulnerable materially (knowledge, finances and technology) in adapting to CCA, but is also about ensuring that the process of adaptation is fair. This relates to the 'cornerstones' as Pelling (2011, p. 49) puts it, of Rawl's 'Theory of Justice', which are distributive and procedural justice. The former considers who will be harmed and by how much they will be harmed, who is responsible for limiting that harm (Meyer & Roser, 2006), and the outcomes of adaptation decisions (Rawls, 1971 as cited in Pelling, 2011). The latter relates to fair process in how the CCA decisions are made (e.g. level of participation) (Adger & Nelson, 2010; Paavola & Adger, 2002), which is shaped by institutions and behaviours (Rawls, 1971 as cited in Pelling, 2011). Hence, who makes the decisions during the process, where the power is vested during adaptation and whose interests are prioritised is important (Adger & Nelson, 2010). This in turn determines the legitimacy and popular consent of the adaptation decisions (Adger et al., 2006 as cited in Pelling, 2011). When considering the focus of this study on government-enabled adaptation interventions; determining who governmental decisions privilege, and who wins and who loses during and post these decisions (Adger, 2003) is essential. The two principles of social justice - distributional and procedural justice - can be achieved in relation to CC by: (a) minority perspectives being recognised in planning and decision-making; (b) by allowing open and free access to knowledge, to enable all affected stakeholders to be able to form their own views and contribute to decision making; and (c) by distributing power so that there is equal participation and decision-making (Paavola, 2005; Paavola et al., 2006 as cited in Pelling, 2011, p. 49).

Justice theories have been defined according to further logics, such as egalitarian principles of equality in the outcomes of decisions, meeting of needs and ensuring equitable command over resources (Sen, 1987 as cited in Pelling, 2011). Pelling (2011) discusses: (a) prioritisation principles: CCA for the most vulnerable; (b) sufficiency principles: everyone gaining what is sufficient for them (which may mean unequal distribution of support); and (c) principles of deservedness: the justness of society being determined by whether it has the capacity to give everyone what they deserve (Grasso, 2008 as cited in Pelling, 2011). Social justice in this thesis relates to both the value of the outcomes of the adaptation, which aligns with consequentialist theories of social justice, as well as whether just procedures and rules were followed, which aligns with deontological theories (Paavola & Adger, 2002). This is done with full acknowledgement that achieving both these aims is often difficult, as the best outcomes for the greatest number of people often runs counter to the best process, involving the arduous procedures of transparent participation and democratic decision-making (Paavola & Adger, 2002).

Scalar issues are also of importance when adhering to a social justice agenda, particularly in relation to how access to resources, power and decision making interact across space and time (Adger & Nelson, 2011). Paavola and Adger (2002) indicate that all decisions, at all scales (time and space) have justice implications, as the scale at which decisions are made have implications for what options exist, and how the costs and benefits of adaptation responses are distributed. The particular scale also influences the decision-making procedures, which links with procedural justice.

CC is inherently an ethical issue (Grosso, 2007; Hartzell-Nichols 2011 as cited in Klein et al., 2014) and is different to any other form of adaptation that has occurred in the past, as it involves avoiding harm caused by others (Adger & Nicholson-Cole, 2010). Ethical issues relate to how the responsibility to reduce greenhouse gas emissions is distributed globally, how to distribute responsibility in ensuring that the most vulnerable are able to adapt to the changing conditions, and ensuring procedures for adaptation decision making are fair. To achieve fair adaptation, Adger and Nicholson-Cole (2011) advocate that one needs to understand the scale and nature of CC risks in relation to other environmental stresses, identify who and what is vulnerable, and who is responsible for adaptation action. One also has to consider the social justice implications of policy and practice, and develop approaches that support creativity, vision and inclusive and participatory decision making (Adger & Nelson, 2010). This involves expanding what is considered legitimate knowledge and whose interests are considered, as well as prioritising the protection of vulnerable communities (Adger & Nelson, 2010). Adger and Nicholson-Cole (2010) expand the ethical dimensions of CC even further, by asking: do communities have the right to not suffer from anthropogenic CC, especially when it jeopardizes their basic human needs (such as health and livelihoods), and do these rights extend beyond the present generation, or even to the natural world?

Pelling (2011) argues that CCA is an opportunity for social reform, bringing into question the underlying values that lead to developmental inequalities and unsustainable development. But this is complicated as values are not universal or constant over time. Ensuring equity in relation to the global challenge of CC will likely require a complex and time-intensive governance process (Klein et al., 2014). Nevertheless, Pelling (2011) advocates that we should question what future we are aiming to achieve via adaptation, and what the underlying socio-political choices that inform adaptation are. What adaptation options are selected and how they are implemented has ethical implications (Klein et al., 2014). For example, if preservation of the present economy is the overriding goal, ecological systems and intra- and inter-generational equity are likely to be negatively affected. This overlays the fact that in general CC shifts responsibility for CCA from present to future generations (Klein et al., 2014).

Social justice, as discussed here, is at the heart of the CBA agenda (Ebi, 2009). CBA, which aims to assist the most vulnerable in adapting to CC within their context, has an important role to play in enabling social justice. CBA is concerned with both distributional and procedural justice, in ensuring that the most vulnerable receive the tools they need to adapt in a way that is empowering, allowing them to lead the changes within their communities (Reid et al., 2009).

1.5. THESIS STRUCTURE

My thesis is divided into three parts (see Figure 1.1). The first part deals with the conceptualisation of my research, which is based on theoretical and empirical contributions within the literature. Part I begins with the introductory chapter, which provides the motivation for my research, the aim and objectives of my study and the broad philosophical and theoretical underpinnings of my research. Chapter 2 contextualises municipal planned CCA and CBA by discussing CC and South Africa's (SA's) response and discourse in relation to this phenomenon (this as my four case studies are located in SA), as well as describing how CCA and CBA are understood in this study. In Chapter 3 I then build on the philosophical and theoretical underpinnings of Chapters 1 and 2, by describing the literature-based understanding of barriers to and enablers of adaptation and frameworks used to understand barriers to CCA. I draw from the understanding built in Chapters 1 - 3, to develop my own conceptual framework of barriers to and enablers of planned CCA (Section 3.4). This framework is then used to conduct a systematic literature review on barriers to planned CBA in developing countries, which is presented in Chapter 4. Chapter 4 concludes the first part of my thesis, where both traditional and systematic literature reviews were conducted to better understand barriers to planned CCA and CBA.

Part II contains the empirical work of my research and begins with Chapter 5, which outlines the methodology and methods I employed. This chapter explains the choice of South African case studies, outlines important aspects of each case study, and explains the case study methods employed when analysing the barriers and enablers operating in the cases. Each case study is reported on within its own Chapter (Chapters 6 - 9), which includes comparable sections dealing with context, case study specific methods employed, the evolution of the case's CC work, discussion on the barriers and enablers discovered, and their implications for CBA.

Part III includes the synthesis and concluding chapters of my thesis. It is within this part of my thesis that discussion is presented on the major findings of my work and the contribution this makes to the field of barriers to adaptation. The penultimate chapter (Chapter 10) draws the thesis together by reflecting on the key themes which were apparent when comparing the barriers and enablers experienced across the case studies, and discussed in the literature. The concluding chapter (Chapter 11) makes final remarks as to this study's contribution to the CCA and CBA field, by discussing

municipalities' ability to enable CBA, and presenting recommendations for practice and research, in relation to progressing the fields of municipal enabled CCA and CBA.

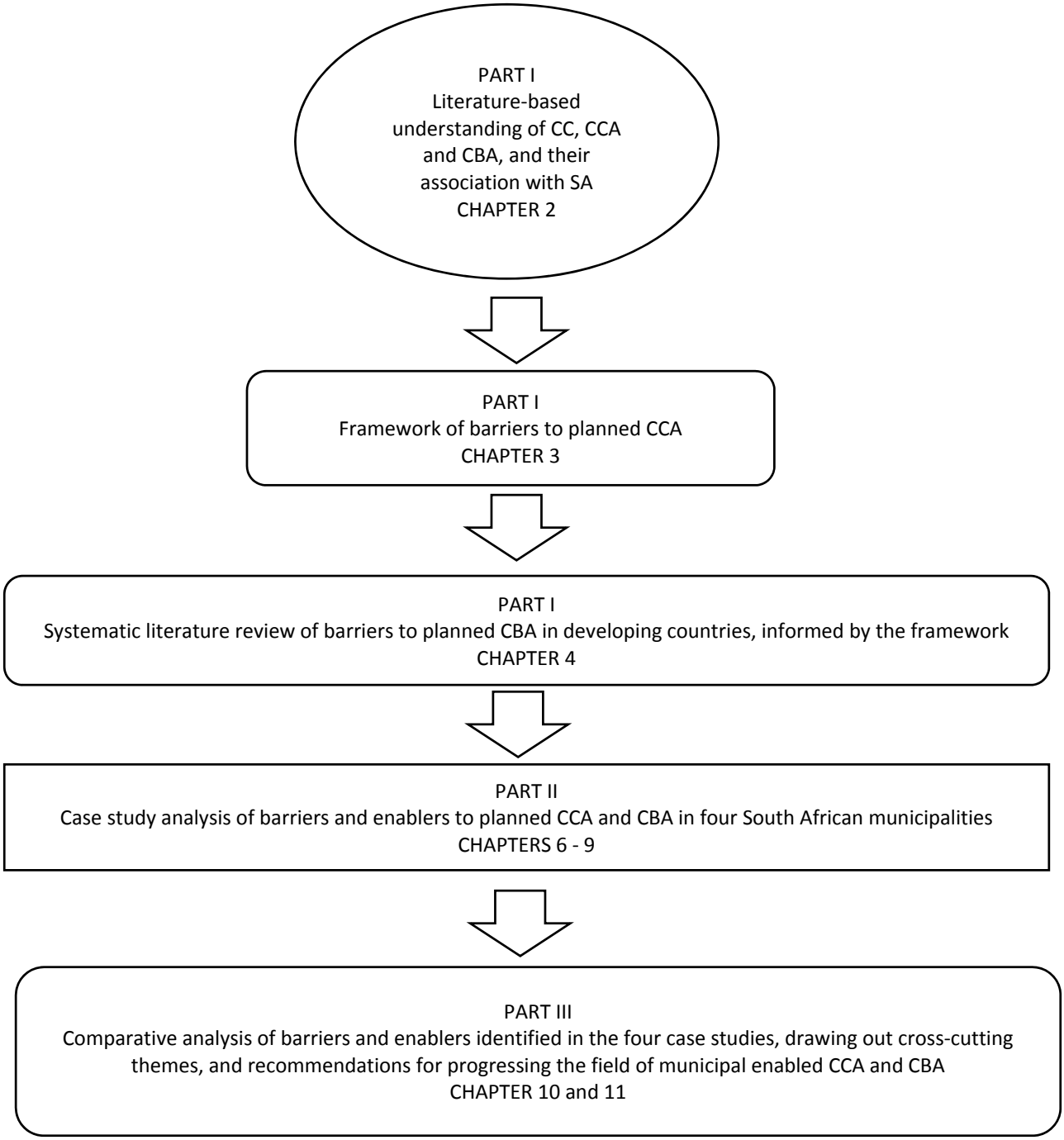

Figure 1.1. Research process with corresponding parts and chapters

CHAPTER 2: SETTING THE CONTEXT: MUNICIPAL PLANNED COMMUNITY BASED ADAPTATION

2.1. OVERVIEW OF CHAPTER

This chapter contextualises my study by discussing how CC is being dealt with in SA; the various framings, approaches and aspirations of CCA; and what CBA is understood to entail in this study.

2.2. CLIMATE CHANGE AND SOUTH AFRICA'S POLICY RESPONSES

2.2.1. Climate change is real and will impact South Africa

Since the 1950s, warming of the climate system has been indisputable (IPCC, 2013). The largest contributor to this warming is the increase of atmospheric carbon dioxide concentrations since 1750, resulting from human-induced burning of fossil fuels and net land use change (IPCC, 2013). The goal, held by more than 100 nations (Rogelj et al., 2009), is to keep the global temperature increase below 2°C, as crossing this threshold is regarded as unsafe (Meinshausen, 2005). However, this is unlikely to be achieved under two of the scenarios presented in the IPCC's AR5 (by 2100 relative to 1850 - 1900) (IPCC, 2013). In their fourth assessment report the IPCC (2007) predicted between a 1.1 and 6.4 °C increase in global average temperature by 2100 (relative to 1980 - 1999 temperatures). The AR5 climate models improve on the previous IPCC assessment reports by including the implications that climate policies may have on future climatic changes. The revised projections indicate that the global surface temperature change by the end of the century will exceed 1.5°C (relative to the 1850 - 1900) for four of the scenarios[7] (called representative concentration pathways) (IPCC, 2013).

CC projections for SA indicate temperature increases of between 3 to 4°C along the coast, and 6 to 7°C in the interior of the country by 2100 (Government of SA, 2011). Rainfall projections are less certain, but seem to indicate that the south western parts of the country will experience general drying, with the northern and eastern parts of the country becoming slightly wetter (Midgley et al., 2007). The Long Term Adaptation Scenario Flagship Research Programme (LTAS) reports a general warming trend until the end of the century for most of SA (Department of Environmental Affairs, 2013). Rainfall projections indicate drying in the west and south, and wetter conditions in the east (Department of Environmental Affairs, 2013). These changes in temperature and rainfall will have implications for SA, in relation to seasonal shifts, the frequency and intensity of extreme events, and sea level rise (Government of SA, 2011). In January 2014 MacKellar, New and Jack published a paper where observed climatic trends for a number of stations in SA were compared to statistically downscaled global climate model simulations. The complexity of projecting CC impacts was revealed

[7] Not for the strong CC mitigation scenario.

when the models did *"not represent the observed rainfall changes nor the cooling trend of minimum temperature in the central interior"* (MacKellar, et al., 2014, p. 1). These discrepancies are representative of the uncertainty and complexity of the science of CC, which is a barrier to CCA that was discussed in many of the papers analysed during the systematic literature review (see Section 4.3.3.2), and was emphasised in two of the four empirical case studies (see Sections 6.6.1 and 8.7.1.2).

2.2.2. South Africa's policy responses

"The responsibility of ensuring the implementation of CCA rests mainly with the government (national or local)" (Motsa, 2011, p. 153). In line with this, the Government of SA has taken significant steps to combat CC, which are represented in Figure 2.1. Ratifying the UNFCCC (Figure 2.1[a]) and Kyoto Protocol (Figure 2.1[b]) were important first steps as it meant that SA recognised the importance of combating CC and linked the country into an international network of concerned governments. In relation to CCA, it meant that SA became bound to formulate and implement programmes to facilitate CCA and cooperate in preparing for CC. The National CC Response Strategy (Figure 2.1[c]) although recognising the importance of dealing with CC, introduced a proviso related to the economic realities of SA and the global inequity with regards to wealth distribution by stating that CC efforts in SA have to achieve sustainable development objectives via no-regrets interventions. The Long Term Mitigation Scenarios (Figure 2.1[d]) outlined different mitigation scenarios for SA, to inform long-term planning (Energy Research Centre, 2007).

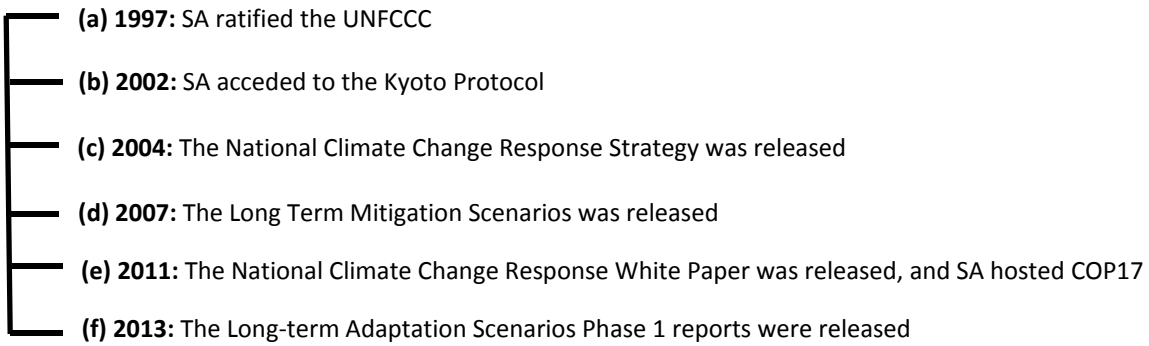

Figure 2.1. Key CC policy milestones in SA

The CC Response White Paper, released in time for the 17th Conference of the Parties to the UNFCCC (COP17) (Figure 2.1[e]), made a strong move to address adaptation with the same emphasis as mitigation. Its two objectives are: (a) to manage CC impacts while building and sustaining SA's social, economic and environmental resilience and emergency response capacity; and (b) to make a fair contribution to global greenhouse gas reduction goals, while allowing development to proceed in a sustainable manner (Government of SA, 2011). Both these objectives align with the National CC Response Strategy's proviso discussed above. The White Paper dedicates an entire section to

adaptation, which is divided into sectors prioritised for CCA responses: water; agriculture and commercial forestry; health; biodiversity and ecosystems; urban, rural and coastal settlements; and disaster risk reduction and management (Government of SA, 2011).

The Long Term Adaptation Scenarios (Figure 2.1[f]) respond to the White Paper's call for national and sub-national adaptation scenarios and development pathways. It investigates the potential impacts of a set of CC scenarios on key sectors, and evaluates the socio-economic and environmental implications of CC for SA. The sectors focused on for CCA responses differ slightly from those prioritised in the White Paper, and include: agriculture and forestry; human health; and marine fisheries and biodiversity (Department of Environmental Affairs, 2013). The Long Term Adaptation Scenarios report endorses the principles of both CBA and Ecosystem Based Adaptation (*"the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of CC"* [IPCC, 2014, p. 11]); highlighting the potential that ecological infrastructure has to provide adaptation benefits, and ensure that vulnerable communities (who reside at the heart of CBA) are more resilient to present and future changes (Department of Environmental Affairs, 2013).

Specifically in relation to this study's focus on municipal planned CCA, the CC Response White Paper (Government of SA, 2011, p. 37) highlights the importance of municipal enabled CC by stating that:

> *Local government plays a crucial role 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. CC considerations and constraints will be integrated into municipal development planning tools such as Integrated Development Plans, and municipal service delivery programmes.*

However, the White Paper states that the mandate for local government to take on CC-related issues is not always clear, and thus recommends a critical review[8] of policy and legislation in relation to municipal CC functions and powers (Government of SA, 2011). A further challenge highlighted, is the fact that the current municipal fiscal mechanisms do not incentivise mainstreaming of CC responses into local government activities (Government of SA, 2011). Here too, a recommendation is made for re-examination[9] of the current fiscal measures, to incentivise municipal enabled adaptation and mitigation (Government of SA, 2011). The issues of municipal mandate and fiscal mechanisms in relation to CCA, are discussed further in Chapters 6 - 11.

[8] The Department of Cooperative Governance and Traditional Affairs is tasked with this review.
[9] Led by National Treasury.

2.2.3. Climate change discourses and South Africa

A discourse can be defined as a *"a shared meaning of a phenomenon"* (Adger et al., 2001, p. 683) or as *"a specific ensemble of ideas, concepts and categorizations, produced, reproduced and transformed in a particular set of practices and through which meaning is given to physical and social realities"* (Hajer, 1995, p. 44). Discourses allow us to translate, condense, reduce and therefore understand the complex world that we exist within (Fairclough, 2005), and exist at the confluence of knowledge and power (Foucault, 1979 as cited in Arnall, Kothari, & Kelman, 2014). It is through discourse that scientific findings on CC are transferred or transformed into policy, and meaning given to the problem or solution being proposed (Lange & Garrelts, 2007). CC itself, is a discursive concept, operating across scales and influenced by and influencing knowledge and power. CCA, being a changeable social process (Adger, 2003), is influenced by the discourses that individuals and organisations adhere to. Discourse influences policy, and shapes whether a problem is publically perceived and whether political actors are willing to implement change (Kingdon, 1984 as cited in Lange & Garrelts, 2007). It also influences the construction and use of scientific knowledge (Arnall et al., 2014) and the communication between science and policy, and therefore may increase or decrease the science-policy divide. An example of such influences is how the IPCC's 'risk discourse', which communicates CC uncertainties using probabilities, is difficult for non-scientists to understand and interpret correctly (Lange & Garrelts, 2007).

Adger, Benjaminsen, and Svarstad (2001) adhere to the understanding that there is a dominant or hegemonic global CC discourse, which is managerialism. They term the alternative discourses profligacy. Managerialism and profligacy differ in what they consider the causes of CC to be. Managerialism blames institutional/policy failure and population growth, and profligacy over-consumption and the capitalist system (Adger et al., 2001). Their solutions to CC differ too. Managerialism calls for international action, technology and resource transfers, reduction of population growth and CCA. With the mantel for reducing population size falling predominantly at the developing world's door, who will be most affected by CC (Adger et al., 2001). Profligacy calls for preventative action and a new economic order[10] (Newell, 2000 as cited in Adger et al., 2001), blaming the developed world for CC (Adger et al., 2001). Similarities between the two are that they both derive authority from science and scientific assessments at global or continental scales, with profligacy also drawing on a moral imperative. Neither considers the social processes of adaptation, and both see society as fragile and disempowered in relation to CC (Adger et al., 2001), which is opposed to the

[10] Which aligns with transformational adaptation: see Section 2.3.2.3.

principles of social justice and CBA (see Sections 1.4.3 and 2.4). Hence Adger et al. (2001) assert that these global discourses are illegible at local scales where vulnerability and adaptation manifest.

Empirical case study research conducted by Arnall et al. (2014), revealed that when the managerial discourse is in operation, CC is managed by professionals with technical expertise, who decide what is legitimate social action, increasing the intellectual distance between donor and recipient. Within the managerial discourse, vulnerable communities are portrayed as dependent on Western assistance and the technical solutions its experts prescribe (Arnall et al., 2014). The underlying political conditions of vulnerability and exploitation are often ignored, with the physical hazard being dealt with primarily (Arnall et al., 2014).

Top-down practices, which align with managerialism, promote adaptation which focuses on technical or infrastructural solutions such as incentives, regulations, capital financing and implementation of large projects (Leary et al., 2008). The methodology often used in this approach is the downscaling of CC impacts via Global Circulation Models for relevant sectors and then determining national measures to cope with the projected impacts (Ministry of the Environment of Japan, 2008c cited in Sekine et al., 2009). These national actions have been critiqued for their lack of consideration of inter- and intra-community heterogeneity, which runs counter to the social justice sentiments discussed in Section 1.4.3. These relate to ensuring that minority perspectives are recognised, that the views of affected stakeholders are taken into account, as well as distributing power for fair participation in decision making (Paavola, 2005; Paavola et al., 2006 as cited in Pelling, 2011).

The major policy, legislation and funding for CC to date, has been implemented in a top-down fashion from international and national levels (Leary et al., 2007, 2008). The UNFCCC considers nation states as the primary organisations for ensuring that adaptation happens (Thornton & Manasfi, 2010). Nation states have tended to deal with environmental limits or constraints by transcending or overcoming them (Thornton & Manasfi, 2010), and have a tendency to not take account of local uniqueness, heterogeneity, context, and the importance of socio-institutional issues, which influences how people are linked to policy interventions (Thornton & Manasfi, 2010). This top-down approach runs counter to social justice imperatives and CBA (see Sections 1.4.3 and 2.3). This being said, there are advantages to nationally-led programmes, as they can occur at the scale and intensity that local programmes cannot, due to national government's ability to garner significant funds and political will-power. An interesting middle-ground is operational in Nepal, where national government has committed to 80% of the climate finance received to being used at the local level (Uprety, 2011 as cited in Ripley & Sharma, 2011). This provides a situation where national government can take advantage of its ability to garner significant funds, and then disburse it to where it is needed most. Who determines the goals

of this cross-scalar CCA is unclear, as organisations operating at different spatial scales will have different goals for adaptation (Adger et al., 2009).

According to Pressend (2011), most of the adaptation solutions proposed in SA are limited technical solutions or 'fixes', which would align SA's discourse with managerialism, as discussed by Arnall et al. (2014), and both managerialism and profligacy, as discussed by Adger et al. (2001). It is clear from the National CC Response White Paper (Government of SA, 2011), the Long Term Adaptation Strategy (Department of Environment Affairs, 2013) and the Long Term Mitigation Strategy (Energy Research Centre, 2007), that SA, like most countries dealing with CC, relies on expert knowledge to inform its policies and actions, which are government-led. This being said, the White Paper in particular uses rhetoric which would align with the social justice and CBA foci of this thesis. Key principles of the White Paper are to promote equity, consider the special needs and circumstances of the most vulnerable, uplift the poor, and conduct informed participation (Government of SA, 2011). The strategic approach of the policy is said to be transformational, empowering and participatory (Government of SA, 2011). This rhetoric aligns with a discourse of social and environmental justice, associated with the post-Apartheid environmental movement in SA, which has a rights-based notion of democracy, and frames environmental issues as 'brown issues' (Scott & Barnett, 2009).

However to gain funding from the developed world and participate as part of the UNFCCC, a managerial discourse and an understanding of CC as an environmental/'green' issue, is useful. Some have reported on SA's responses to environmental challenges as technocratic and institutional, and based on expert science, with insufficient attention given to local knowledge (Scott & Barnett, 2009). The National CC Response White Paper indicates that *"in addition to the refinement of top-down approaches, developing more bottom-up approaches informed by the resources of local communities and local government will deliver results with a higher degree of confidence than is currently possible"* (Government of SA, 2011, p. 15). Balancing these top-down and bottom-up approaches, as well as development and environmental protection, is a challenge for the government of SA, which at its core needs to deliver socio-economic benefits to its citizens. Chapter 10 in the CC Response White Paper is entitled *"mainstreaming climate-resilient development"*; it advocates for increased co-ordination and alignment of South African government policies and actions with the objectives of the CC Response White Paper (Government of SA, 2011, p. 34). The discourse articulated throughout the White Paper is developmental, with advocacy for win-win solutions, where CC can be dealt with, while the country develops socio-economically (Government of SA, 2011). This, regardless of the fact that the Long Term Mitigation Scenario report indicated that SA will not be able to achieve the emission reductions required by science with continuous socio-economic growth (Energy Research Centre, 2007). How

these discursive issues play out in relation to municipal planned CCA and CBA is explored further in Chapters 6 - 11.

2.3. CONCEPTUALISING ADAPTATION AS A RESPONSE TO CLIMATE CHANGE

As the American Geophysical Union (2013, p. 1) states *"human-induced CC requires urgent action"* (see Sections 1.2 and 2.2). In response to this growing acknowledgement, the IPCC has delineated two responses: mitigation and adaptation (both defined in Section 1.2). To date, mitigation has received the majority of international focus (Adger & Nicholson-Cole, 2011; Burton, Diringer, & Smith, 2006 as cited in Tamiotti et al., 2009; Revi et al., 2014; Shalizi & Lecocq, 2009). Reasons for this being that mitigation is seen as the ultimate solution to CC, which is needed to avoid dangerous levels of climatic change (Adger & Nicholson-Cole, 2011). The international focus on CC mitigation contributes, in part, to many cities focusing initially on CC mitigation as opposed to CCA (Revi et al., 2014). CC mitigation seeks to rectify the cause of the problem, and fits more naturally into present market mechanisms, making it easier to fund (Burton et al., 2002; Pielke, 1998 as cited in Berrang-Ford et al., 2011). Klein et al. (2007) discuss a scalar split between CCA and mitigation; mitigation being more of a global phenomenon (benefits of mitigation will accrue globally), driven mainly by international and national policy, and adaptation (benefits accrue locally to nationally) being driven by private or public actions to assist those who will be affected by CC impacts at the local and community levels. CC impact uncertainty has hindered CCA focus and there has been a general reluctance to deal with issues implicit to CCA, such as liability, compensation, equity and fairness (Paavola, Adger, & Huq, 2006). Despite the focus on mitigation, interventions to achieve its goals have been limited (Eisenack & Stecker, 2012; Roberts, 2013). Global greenhouse gases have increased by 70% from 1970 to 2004 (Barker et al., 2007), and atmospheric carbon dioxide concentrations passed 400 parts per million [11] in May 2013 (Griffin, n.d).

As discussed in the introductory chapter, developing countries, which house most of the world's poor people and possess adaptation deficits, will likely be affected more by CC than developed countries (Newell & Paterson, 2010); despite developing countries having contributed minimally to historic emissions (Agrawal & Perrin, 2009; Newell & Paterson, 2010) (relates to social justice, see Section 1.4.3). However, rising economic powers in the developing world (e.g. China, India, SA, Nigeria and Brazil), are developing via the same fossil fuel intensive path that developed countries followed and are now contributing significantly to global greenhouse gas emissions. Hence, CC calls for global cooperation on a scale never seen before, to allow international movement towards a low-carbon and

[11] The highest atmospheric carbon dioxide concentration recorded since the National Oceanic and Atmospheric Administration's atmospheric observation centre (based at Mauna Loa, Hawaii) began recording global atmospheric carbon dioxide in 1958 (Griffin, n.d).

CC resilient future (Newell & Paterson, 2010). Despite these calls, commitments to abate CC have been difficult to come by. This may be due to the fact that CC risks are not always obvious and experienced, and the sacrifices needed for CC commitments to work, are often deemed unacceptable (Shogren & Toman, 2000 as cited in Grasso, 2007). Much of this relates to the fact that nation-interests and priorities have been prioritised over the global good (Townshend & Mathews, 2013).

Lack of mitigation action and acknowledgement that regardless of the level of mitigation achieved, impacts of CC will persist for many centuries (IPCC, 2013), has led to the realisation that adaptation is essential (Berrang-Ford et al., 2011; Revi et al., 2014) (see Section 1.2). Adaptation must go beyond coping (surviving under prevailing conditions [Pelling, 2011]), as coping often leads to the degradation of the resource base (Taylor, Harris, & Ehrhart, 2010), where valuable assets are converted to achieve lower-order outcomes (Pelling, 2011).

The increased focus within the CC field on CCA has been described by Huq and Toulmin (2006), and is summarised in Figure 2.2.

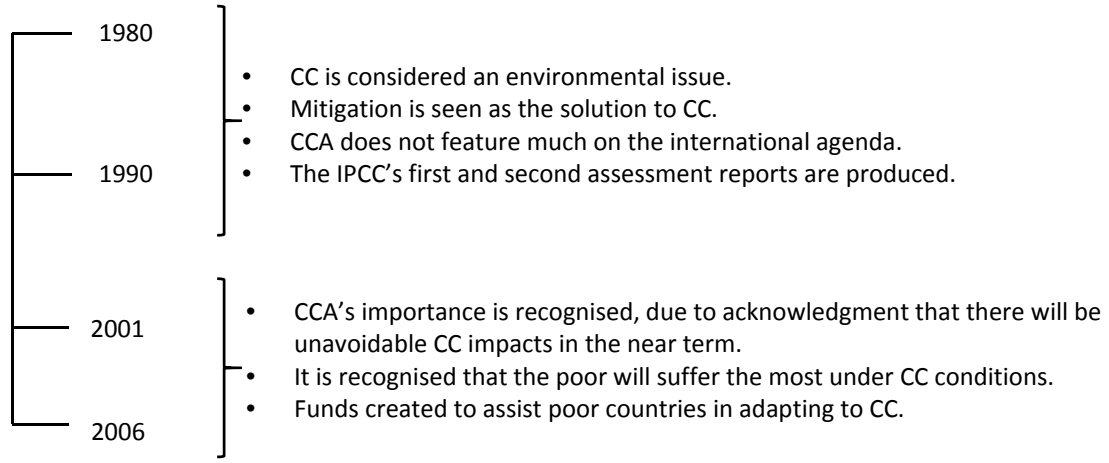

Figure 2.2. The rise in adaptation focus from the 1980s to 2006, according to Huq and Toulmin (2006)

This figure documents what Huq and Toulmin (2006) have called the two eras of CC, with CCA receiving an increased level of attention post the 2001 IPCC Third Assessment Report, which highlighted the importance of CCA. This shift in focus is also represented by two events, which bolstered international recognition for CCA. The first is the Nairobi Work Programme on Impacts, Vulnerability and Adaptation to CC, which was initiated in 2005. It aims to assist all parties to the UNFCCC to: (a) improve their understanding and assessment of CC impacts; (b) their vulnerability; and (c) make sound decisions on actions and measures to adapt to CC (UNFCCC, 2012a). The second, is the Adoption of the Cancun Adaptation Framework in 2010, which: (a) encourages parties to plan, prioritise and implement adaptation actions; (b) instructs developed countries to provide developing countries with the finance,

technology and capacity-building required to deal with adaptation implementation; and (c) institutionalises a global Adaptation Committee as well as regional and national centres, networks and organisations (UNFCCC, 2012b). The framework is driven by principles such as adaptation should be country-driven, and sensitive to gender and marginalised and disadvantaged groups (UNFCCC, 2012b) (aligns with social justice, Section 1.4.3). The Cancun Adaptation Framework endorses adaptation based on the best available science and indigenous knowledge, that is integrated into diverse policies and actions, and that prioritises stakeholder engagement (UNFCCC, 2012b) (aligns with certain CBA principles, Section 2.4). One of the outcomes of COP20 was the Lima Call for Climate Action, which affirms a commitment to strengthen CCA at COP21 and to address mitigation and adaptation in a balanced manner (UNFCCC, 2014). Aligned with the social justice perspective of my research (Section 1.4.3), Huq (2013) has named a third era of CC: 'climate justice', which he asserts began in 2009. During this era CC is understood to be a moral issue, with proposed solutions to CC being morally based. He calls for a fourth era where the fight against 'climate injustice', is taken forward via global solidarity.

Despite the progress discussed above, many still believe that CCA is not being given adequate attention, with the UNFCCC text both within the convention and the Kyoto Protocol rather weak in relation to the legal imperatives of CCA, and focused more on adaptation planning as opposed to action (Pressend, 2011). While not the only condition needed to enable CCA, Pressend (2011) argues that there is inadequate commitment of international funding for CCA action and when available this funding is difficult to access due to excessive red-tape. Financial mechanisms that have been set up to provide funding for CCA include: the Global Environment Fund, the Special Climate Change Fund, the Least Developed Countries Fund, the Adaptation Fund and the Green Climate Fund (launched at COP17). The Green Climate Fund aims to form a major global channel for long term financial support to assist developing countries in adapting to CC (UNFCCC, 2012c). Challenges exist in mobilising the finances for these funds, and in relation to who should control them: developing countries where the majority of adaptation work is needed, or developed countries, who will be supplying the majority of the finance (The Adaptation Network, 2012).

Nevertheless, since 2006, research, planning and implementation of CCA has continued to grow. This has manifested in the comprehensiveness and expansion in size and depth of the IPCC's AR5 Working Group II report, which deals with CC impacts, adaptation and vulnerability. Chapters included in the report of particular relevance to this study are: (a) the chapter on adaptation opportunities, constraints and limits; (b) the chapter focusing on the African region; (c) a chapter focusing on livelihoods and poverty; and (d) an urban-focused chapter.

An important step forward for municipal enabled CCA occurred in 2011, when the Durban Adaptation Charter was signed by 114 signatories, representative of 950 local government organisations, from 27

countries (Durban Adaptation Charter, 2014). This charter is significant because it raises the profile of local government as essential stakeholders in both CCA implementation as well as at the international CC negotiations. The charter commits local governments to CC action that will assist communities in their ability to respond and cope with CC, with a focus on the most vulnerable (aligns with the social justice perspective and CBA). It endorses sustainable economic development as well as the importance of functioning ecosystems in achieving its goals. It is also an important milestone to note, as SA played a vital role in its establishment, which occurred during a local government conference, organised by the South African government and partners (Durban Adaptation Charter, 2014). More discussion on the Durban Adaptation Charter will occur in Chapter 6, as eThekwini Municipality, one of my case study municipalities, is now playing an essential role in ensuring the implementation of the charter.

The positive response that the Durban Adaptation Charter has received is indicative of local government engaging more and more in CCA work. In 2012 a global survey was conducted to ascertain, amongst other things, what the status of urban adaptation planning is. Carmin, Nadkarni, and Rhie (2012) indicate that 68% of cities surveyed worldwide reported that they had initiated some form of adaptation planning, with only 18% stating that implementation of CCA had occurred or was occurring. This is in agreement with much of the literature, which indicates that adaptation is still in most cases being understood and planned (Berrang-Ford et al., 2011) (also found in the systematic literature review I conducted, see Section 4.3.1).

2.3.1. Framings and approaches to CCA

The field of CCA has evolved significantly as a response to CC (see Section 2.3). Many lessons have been learnt along the way, including: (a) that adaptation is an iterative and messy actor-centric process (Moser & Ekstrom, 2010) (hence the need to consider governance, see Section 1.4.2); and (b) that the desired outcomes of CCA may not be held universally (see Section 2.3.2), as they are dependent on discourse, values and scale (Moser & Ekstrom, 2010).

Fùnfgeld and McEvoy (2011) describe four approaches to CCA, where approach is understood to be a way of doing CCA informed by specific *"adaptation goals, disciplinary traditions, and country-specific decision-making systems and preferences"* (Fùnfgeld & McEvoy, 2011, p. 12). Key features of these approaches are listed in Table 2.1. The hazards approach is strongly aligned with disaster risk management and has been a dominant consideration within CC policy discussions. Fùnfgeld and McEvoy (2011) argue that it is this framing that leads to decision makers calling for more detailed modelling of CC impacts to be able to plan for the hazards associated with them (see Sections 6.6.1.2 and 8.7.1.2). The risk management approach (directly related to the hazards approach) has become a

dominant approach within the organisational practice of local government, where issues such as uncertainty and perception in relation to risks are important, and where risk management often triggers government to conduct CCA actions (Fùnfgeld & McEvoy, 2011). The IPCC's AR5 can be seen to endorse the risk management approach, with a risk-based framework being presented for the assessment of adaptation opportunities, constraints and limits, and to ensure that risks remain within a range that is tolerable to the target audience (see Klein et al., 2014 and Section 3.4).

Table 2.1. Approaches to CCA (Fùnfgeld & McEvoy, 2011)

Approach	**Key features of the approach**
Hazards	• Is concerned with the *"potential occurrence of a natural or human-induced physical event or trend…"* (IPCC, 2014, p. 15), with the priority being to save assets and lives.
Risk management	• Is concerned with how hazards interact with vulnerability to create risks, as well as the consequences and likelihood of those risks.
Vulnerability	• Is concerned with how exposure (experience of climatic stressors), sensitivity (responsiveness to the stressors) and adaptive capacity, shape vulnerabilities. • Considers what kinds of impacts a community may be faced with, how those impacts will affect them, and their ability to cope or take advantage of them. • Divided into outcome vulnerability: vulnerability to residual impacts post the enactment of feasible CCA, and contextual vulnerability: *"present inability to cope with… changes… generated by multiple factors and process"* (O'Brien et al., 2007 as cited in IPCC, 2014, p. 8).
Resilience	• Founded within the ecological/ environmental science fields and is about a system's ability to cope with changes and maintain functionality. • Critiqued from the perspective that often returning to a previous state will be maladaptive under changing conditions.

The vulnerability approach focuses on the individuals or ecosystems that are most in danger. This approach has been critiqued, as it deviates attention away from ensuring the robustness of the overall system (Adger et al., 2009). Moser and Boykoff (2013a & 2013b) describe vulnerability as addressing social and structural conditions, with the aim of protecting the most vulnerable in society. To them, success takes on an ethical dimension and implies socioeconomic restructuring, empowering the disadvantaged, and moving society towards a more equitable, just and humane future. This understanding, would align the vulnerability approach with the social justice underpinning that this thesis has (see Section 1.4.3). Nevertheless, like is the case with CCA aspirations (Section 2.3.2), I document these approaches here, but make no judgement as to the best framing for CCA and CBA.

Moser and Boykoff (2013a & 2013b) then go on to describe resilience, as focusing on the long-term persistence and functioning of SESs. This approach often has a bias towards ecological and ecosystem functioning, which may be due to the difficulty in incorporating ecological concepts, such as the adaptive cycle or panarchy, into social systems (Bahadur & Tanner, 2014). This is seen to be the case

in SA's Long Term Adaptation Strategy, where eight of the ten references to resilience within the summary for policy makers, are made in relation to biodiversity, natural systems or ecosystems (Department of Environmental Affairs, 2013). The resilience approach is discussed further in Section 2.3.2.1.

Another point to make in relation to these approaches is that they are often used interchangeably. The hazards and risk management approaches are interlinked, and despite their different meanings, vulnerability and resilience are often used together in the following way: *"increase the resilience, and reduce the vulnerability of ecosystems and people"* (Department of Environmental Affairs, 2013, p. 9). One has to question whether the use of the terms, especially within the public domain is in line with the generally held definitions of vulnerability: exposed to the possibility of being harmed, and resilience: the capacity to recover from difficulties (Oxford Dictionaries, 2014); as opposed to how they are defined in the academic/research fields (Table 2.1). All four approaches are linked by the IPCC (2014, p. 10) when they define disaster risk reduction as *"both a policy goal or objective, and the strategic and instrumental measures employed for anticipating future disaster **risk**; reducing existing exposure, **hazard**, or **vulnerability**; and improving **resilience**."*

A final and particularly important point to make within this section, relates to how adaptation is defined and understood in relation to development. McGray, Hammil and Bradley (2007) indicate that how adaptation relates to development differs across circumstances, making the universal delineation of adaptation and development impossible. It is difficult to do because: (a) on virtually all occasions, CCA action achieves other objectives too; (b) the strategies to reduce vulnerability to climate impacts are often the same ones used to deal with non-climate stresses; and (c) it is difficult to dissociate anthropogenically induced CC from natural climate variability (McGray et al., 2007). What this means is that adaptation interventions often look like development interventions, and vice versa (which was found to be the case in the four case studies explored, see Chapters 6 - 9). McGray et al. (2007) developed a framework which considered a continuum of adaptation interventions, from those that are more vulnerability/ development focused, addressing the drivers of vulnerability, to those that are more impact focused, dealing with CC impacts specifically (which relates to generic and specific capacity, see Section 2.3.2.1). In this thesis I do not make a judgement in relation to what is CCA as opposed to development, instead my aim was to discover how municipalities understand and are able to plan and implement adaptation. I do however hypothesise that due to my focus on developing countries, and SA in particular, that it is likely that adaptation interventions will fall predominantly on the left of McGray et al's (2007) continuum: interventions that address the drivers of vulnerability and build response capacity, due to the fact that developmental challenges in these contexts are significant and of paramount importance.

2.3.2. CCA aspirations/outcomes

Within adaptation, Pelling (2011) describes three aspirations/visions/intentions/outcomes: resilience, transition and transformation. These aspirations, described below, whether explicitly or implicitly chosen, affect how CCA is understood and the kind of adaptation interventions planned and implemented, and hence the barriers and enablers experienced.

2.3.2.1. Resilience

The resilience framing has become fairly common within SES and CCA thinking (Section 1.4.1), both within the academic and practitioner fields (Folke, 2006; Meybeck, Lankoski, Redfern, Azzu, & Gitz, 2012), and hence needs to be understood as part of this study. The resilience of SESs has been described as their ability to maintain core functions under ever-changing cross-scalar circumstances (Bahadur & Tanner, 2014), including their ability to anticipate, adapt to and recover from events (Welsh, 2013). It has also been described as *"a catch all term for adaptation"* (Bahadur & Tanner, 2014, p. 201), being used by multiple disciplines that seek to understand complex SESs (Welsh, 2013) that embark on continual adaptive cycles, where growth, accumulation, restructuring and renewal occur (Gunderson & Holling, 2002 as cited in Welsh, 2013).

In relation to CC, planning for resilience can be based on CC projections, or not, which is similar to Eakin et al.'s (2014) description of specific capacity, which relates to climatic threats, and generic capacity, which relates to human development. Drawing parallels with resilience, specific resilience would be CC resilience, defined as *"the ability to survive and recover from the effects of CC"* (Rockefeller Foundation, 2009, p. 1). Generic resilience, would relate to being resilient to a multitude of potential futures, regardless of the CC projections. As Burkett et al. (2014, p. 2) state: *"CC is just one of the many stressors that influence resilience."* This generic (relating Eakin et al. [2014] 'generic capacity' to resilience) understanding of resilience would align with Swanson et al.'s (2010) definition of adaptive policies, which are not developed to be optimal for a predicted future, but to be able to cope with a range of futures.

2.3.2.2. Transition

Pelling (2011, p. 69) defines 'adaptation as transition' as *"reform in the application of governance* [that is] *incremental, undertaken at the level of individual policy sectors or specific geographical areas".* Transitional adaptation aligns with what is termed incremental adaptation: *"extensions of actions and behaviours that already reduce the losses or enhance the benefits of natural variations in climate or extreme events"* (Kates, Travis, & Wilbanks, 2012, p. 7156). Also defined as *"adaptation actions where the central aim is to maintain the essence and integrity of a system or process at a given scale" (*IPCC, 2014, p. 1). This CCA aspiration allows the decision maker to meet current objectives, within changed

or changing conditions (Stafford Smith, Horrocks, Harvey, & Hamilton, 2011). Kates et al. (2012) assert that most adaptation interventions are incremental and familiar, which aligns with Handmer and Dovers' (2009) second type of resilience: 'change at the margins', where the symptoms of the problem are treated.

2.3.2.3. Transformation

Transformation is a concept being discussed with increased frequency in the literature, due to the growing acknowledgment that current systems and structures underlie the major global challenges being faced. In the IPCC's AR5, transformational CCA is linked to adaptation limits (defined in Section 1.2, p. 3), where transformation occurs in response to discontinuities that occur when a limit is experienced (Klein et al., 2014). They define transformational adaptation as "a*daptation that changes the fundamental attributes of a system in response to climate and its effects"* (IPCC, 2014, p. 1), while stating that due to the newness of the concept, a clear operational definition is not apparent (Klein et al., 2014).

Stafford Smith et al. (2011) describe transformational adaptation as changing the variables that control a system's functioning; fundamentally changing a system's objectives. Kates et al. (2012) delineate three classes of transformation: (a) when adaptation is adopted at a much larger scale or intensity; (b) when adaptation is truly new to an area or system; and (c) when adaptation leads to the transformation of places and shifted locations. Hence, *"transformation requires deep shifts in the ways people and organisations behave and organise values and perceive their place in the world"* (Pelling, 2011, p. 86). It is about questioning the fundamental systems that underlie both the causes of and solutions to CC and attempting to change those that are predicted to be maladaptive presently or in the future (Pelling, 2011). This adaptation aspiration requires fundamental changes, significant planning and anticipation, and resource-intensive interventions (Pelling, 2011). To enable transformation requires that: (a) risks and uncertainties are managed; (b) planning, learning and reorganisation skills exist; (c) financial and psychological flexibility is present; and (d) there is a willingness to undertake change (Marshall, Park, Adger, Brown, & Howden, 2012). Transformation is sustained within supportive social contexts, and when acceptable options and the resources needed to enable those options, are available (Kates et al., 2012). Working against transformational initiatives are the uncertainties and costs that have to be incurred, as well as institutional and behavioural lock-in/inertia (Kates et al., 2012).

2.3.2.4. Bringing CCA aspirations/outcomes together

The concepts discussed above, although defined differently, are highly linked, with the potential that different actors, working at different scales, may be seeking to achieve resilience, transition or

transformation simultaneously (Pelling, 2011). Undertaking resilience and transitional work may lead to transformation, by building capacity and weakening the barriers which hinder more fundamental changes to the system (Pelling, 2011). Transition can enable transformational change when new perspectives are included in emerging policy (Pelling, 2011) or when focusing events and multiple stresses are so sizeable that transition[12] is no longer adequate (Kates et al., 2012). However, aiming for any one of these aspirations could endorse or hinder the realisation of another (Pelling, 2011). What enables incremental change could hinder transformational change; for example, attachment to place and occupation, which strengthens social networks, capital, trust and local knowledge sharing; strengthens incremental change, but opposes transformational change (Marshall et al., 2012).

Many authors are integrating the two concepts of resilience and transformation. Handmer and Dovers (2009, p. 198) divide resilience into three types, with the third type being *"open to radical change to social structure and institutional arrangements"*, with the aim of treating the underlying causes of the problem at hand, which aligns with transformational adaptation. Allen and Holling (2010) indicate that novelty/innovation, which is generated from variability, enhances resilience and creates adaptive capacity. Folke et al. (2010) follow a similar logic, stating that adaptation and transformation are essential for a system to maintain its resilience, and the IPCC (2014) includes the ability to transform under changing circumstances, within their definition of resilience. The IPCC also places the definitions of incremental (transition) and transformational adaptation under their definition of adaptation (IPCC, 2014, p. 1). Lastly, Bahadur and Tanner (2014) motivate for 'transformational resilience thinking', which combines resilience (useful for understanding ever-changing uncertainties in complex SESs) and transformational thinking, and calls into question the underlying structures which drive vulnerability and risk, to bring about changes that are deep and sustained.

Bahadur and Tanner's (2014) 'transformational resilience thinking' approach came out of their critique of resilience, which according to them is a concept that is not clear about its goals, in relation to who or what is being made resilient, what good or bad resilience is, and who decides. They argue that this allows agendas to be pushed, and the ability of one group's resilience to be pursued over another groups, leading to marginalisation. They also assert that it does not consider spatial and temporal trade-offs adequately. Resilience that is useful at one spatial and temporal scale, may not be adequate at another. Trade-offs also exist in relation to whether social (human) or ecological (environmental) aspects of SESs are prioritised and this is not explicitly dealt with by resilience. They also see it as a concept epistemologically biased towards the scientific, technical and the rational, without adequate attention to the power-relations of managing risk when human and social systems are involved

[12] Defined as incremental adaptation by Kates et al. (2012), see Section 2.3.2.2.

(aligned with the CC discourses discussed in Section 2.2.3). Resilience has the power to restrain significant changes in institutions and values, as it does not seek to challenge the status quo (Pelling, 2011). This makes resilience an appealing concept to donors and governments, as it is less politically challenging, and its innovations are often more visible and quicker to implement than is the case for transition and transformation.

Pelling (2011) states that it would not be advisable to judge one aspiration of adaptation as better than another. He argues that it is the context, and the goals and objectives of the agent/s of change and the community of concern which should direct which is the most appropriate goal for adaptation; each have their advantages and disadvantages. For example, incremental adaptation may lead to path dependency and lack of flexibility in response to a changing environment; and transformational change, cannot easily be reversed, and therefore if based on misinformed science, communities could become more vulnerable (Pelling, 2011).

A final point to make here, due to my focus on municipal-enabled action, is that most governmental organisations have endorsed an aspiration of sustainability. For example, the CC Response White Paper, endorses the principles of intra- and inter-generational sustainability, and acknowledges the three pillars (economic, social and ecological) of sustainable development (Government of SA, 2011). The core principle of which, is that every generation has the right to use the earth to meet their needs and should have equal opportunity to have these needs met (Beder, 1996). Sustainability, as defined by Chapin et al. (2009, p. 20) draws together the aspirations of resilience and transformation, where it is defined as *"persistence of the fundamental properties of the system or of active transformation through deliberate substitution of different forms of capital to meet society's needs in new ways".* Although what should be sustained and how sustainability is to be achieved, is ambiguous, because sustainability is a value-based concept (Chapin et al., 2009).

2.4. COMMUNITY BASED ADAPTATION

As discussed in Section 1.2, the premise on which my thesis is built, is that planned CBA has a vital role to play in assisting communities (most often meaning a group of people living in a certain area [Sekine et al., 2009]), who will bear the brunt of CC impacts (Reid et al., 2009; UNFCCC, 2012c), in adapting to CC. Poor communities that are reliant on natural resources for survival (Vincent et al., 2010) and have low adaptive capacity for dealing with stresses additional to their everyday coping range (Tompkins & Adger, 2004) are particularly vulnerable to CC (see Section 1.4.3). My research is grounded in a SES paradigm and hence a community itself is seen to be a SES (Chapin et al., 2009); a human community influencing and being influenced by the ecosystem within which it exists.

When it comes to CBA, which is a relatively new field of CCA (discussions on CBA began in earnest in 2005 [Ayers & Forsyth, 2009]), its definition, the values it embodies, what it looks like on-the-ground, as well as best practice CBA are not uniformly held (Dodman & Mitlin, 2013). This is despite the call for the establishment of best practice for scaling-up CBA (Ripley & Sharma, 2011). Taylor et al. (2010) note that CBA is attracting diverse stakeholders that use different terminology and come from vastly different fields. Practitioners, researchers and policy makers from fields as diverse as rural development, economics, agriculture, natural resource management, conservation, disaster risk management, and humanitarian relief, are beginning to find value in CBA and this leads to the potential for a plethora of different understandings of CBA. This can either cause confusion within the field or create a healthy, vibrant and evolving field, as these different groups contribute to its development (Taylor et al., 2010). Vogel, Moser, Kasperson, and Dabelko (2007), in reference to 'resilience', 'coping capacity' and 'adaptation', argue that the linguistic, paradigmatic, theoretical and methodological tensions which exist when concepts are applied across disciplines, offers a range of insights. These insights can lead to slow and mutual transformation across disciplines and a deepening of scientific understanding, as the disciplines learn from each other (Vogel et al., 2007).

Table 2.2 outlines some of the key themes or principles found in discussions on CBA. These themes are in addition to the general principle, that CBA is adaptation at the local-level, in communities who are vulnerable to CC. There are benefits and challenges related to the planning and implementation of CBA in relation to the themes/principles presented in Table 2.2, and these are discussed in Sections 2.4.1 - 2.4.5.

Table 2.2. How CBA is defined in the literature

Citation	**CBA is:**
Ayers and Forsyth (2009)	• DEVELOPMENTAL: It operates via development activities and addresses local development concerns, to improve adaptive capacity. • DRAWS ON VARIOUS DISCOURSES: Vulnerability, resilience and developmental terminology used. E.g. *"Strengthening resilience through development"* (title of Ayers and Forsyth [2009]). • PARTICIPATORY: Generates adaptation strategies using participatory processes (with communities, and development and disaster risk practitioners). • CULTURALLY-SENSITIVE: Builds on existing cultural norms.
Dodman and Mitlin (2013)	• ABOUT EMPOWERMENT: It acknowledges that communities have the skills, experience, knowledge and networks to undertake adaptation activities. • GROUNDED IN THE PRESENT: It acknowledges that adaptive capacity is as dependent on current livelihood opportunities as climatic changes.
Ensor and Berger (2009)	• CONTEXTUAL: It must be rooted in the local context. • PARTICIPATORY: Communities worked with from the outset. CBA engages with indigenous capacities, knowledge and practices, and helps communities understand how CC will affect their livelihoods. • CULTURALLY-SENSITIVE: Changes are rooted in local culture for success.

Sekine et al. (2009)	• BOTTOM UP: The community is the subject of the intervention(s) as well as the main implementer of the intervention(s).
Reid et al. (2009)	• BOTTOM UP: Community-led process based on community priorities, needs, knowledge and capacity. • ACKNOWLEDGES OTHER SCALES: Local, regional, national and international scales need to be considered for the long-term success of CBA. • INCORPORATES DIFFERENT KNOWLEDGE SYSTEMS: Both indigenous and scientific knowledge systems are acknowledged; this to create a fuller understanding of risk, build community trust in scientific data, and conduct on-the-ground verification of scientific data. • COMMUNITY HETEROGENEITY: Households and individuals within a community may have different priorities, needs, vulnerabilities and capacities, which are influenced by age, gender and race. Intra-community dynamics to do with power, class and genealogy, are all important aspects to consider in CBA. • CONSIDERS POWER: Both intra- and inter-community power and how this influences whether or not the most vulnerable are heard and benefit from the CBA.
Adger et al. (2009)	• INCORPORATES DIFFERENT KNOWLEDGE SYSTEMS: Both scientific and indigenous knowledge systems must be given equal footing in the planning and implementation of CBA, while acknowledging that both have gaps and flaws.
Vincent et al. (2010)	• EMPOWERMENT: Communities empowered to drive innovation and experimentation, and to own and lead the interventions, which improves the longevity of projects.
IPCC (2014, p. 7)	• BOTTOM-UP: *"local, community-driven adaptation…"* • INCORPORATES DIFFERENT KNOWLEDGE SYSTEMS: *"an approach that takes context, culture, knowledge, agency, and preferences of communities as strengths..."* • EMPOWERMENT: *"focuses attention on empowering and promoting the adaptive capacity of communities…"*

2.4.1. CBA is bottom-up

The traditional/top-down approach towards adaptation focuses on international or national led and funded programmes, and involves experts and policy makers managing CC based on evidence (see Section 2.2.3). It has been critiqued for being a broad-brush approach, which does not consider the local or community-specific conditions (Suarez, 2012). Not all CCA is good for communities; for example, deviating water from local communities for use on a commercial farm, which feeds removed communities (Suarez, 2012). The bottom-up approach on the other hand, is driven from the community level, in acknowledgement of the fact that much of what is required for adaptation to occur, must occur at this level, and hence must align with communities' knowledge, capacity and needs. To date, up-scaling or mainstreaming bottom-up adaptation has been challenging, leading to Mataki et al.'s (2007 as cited in Leary et al., 2007) assertion that integrating top-down and bottom-up approaches would be most useful for CBA.

2.4.2. CBA is developmental

As is discussed in Section 2.3.1, CBA like the broader field of CCA, is difficult to separate from community based development, as CBA takes the approach of adaptation as development (Ayers & Forsyth, 2009), dealing with the underlying socio-economic drivers of vulnerability. Therefore, there is the potential for CBA to compete for development assistance funding, to the detriment of other developmental priorities (Leary et al., 2007, 2008). This being said, CBA calls for a break from traditional forms of development, which give little consideration to climate risks and often produce greater vulnerability for communities by negatively affecting their social structures or the ecosystem services they rely on, as well as distributing the benefits of development unequally (Leary et al., 2007, 2008).

Perhaps a better way to view adaptation and development, is to see their complementarity, and the synergistic efficiencies and benefits that can occur between them, as well as the value in conducting development that takes CC into account, and vice versus. Ripley and Sharma (2011) indicate that adaptation is becoming mainstreamed within the development agenda due to the fact that *"good adaptation presupposes development"* (Ripley & Sharma, 2011, p. 1). Good development should in fact enable CCA, by: (a) focusing on the vulnerable; (b) encouraging diversification of livelihoods; (c) expanding opportunities for livelihoods that are climate resilient; (d) encouraging development away from at-risk locations; and (e) investing in climate knowledge for reducing risks (Leary et al., 2007, 2008).

2.4.3. CBA is participatory

The participatory underpinning of CBA has resulted from lessons learnt, where non-participatory technology-based adaptation failed without community buy-in (Muraya, 2006; O'Hara, 2002; Thomson and Schoonmaker Freudenberger, 1997). Participatory CBA is said to improve social networks, collaboration and trust, leading to more robust and durable decisions (DESIRE, 2011). It also assists in avoiding mal-adaptation, which occurs when community needs are not taken into account leading to increased vulnerability (UNDP, 2011). Participatory work is resource (both time and money) intensive and there are challenges in motivating communities to work on projects where benefits may not accrue in the short-term, and CC may not be seen as a priority when compared to the numerous day-to-day challenges poor communities face (Asian Disaster Preparedness Centre, 2008; Conway & Mustelin, 2014). Participation is an especially arduous process when communities are dynamic and heterogeneous (Bahadur & Tanner, 2014), as is the case in most South African communities. Participatory work, if not conducted according to best practice, can lead to communities being co-opted for the achievement of an external agenda, while burdening the community with participation

in activities that may not lead to any tangible benefits for them (Reid et al., 2009). Hence, participation should consider power, to ensure that marginalised or disempowered community members are heard (Reid et al., 2009). A further challenge to participatory work, is that of stakeholders having a negative perception of participatory research, based on past experiences, or experiencing 'stakeholder fatigue', when too much participatory work is done in a community over a short period of time (DESIRE, 2011).

2.4.4. CBA incorporates different knowledge systems

Both indigenous and scientific knowledge systems hold significant amounts of CC information (Leary et al., 2007, 2008), but bridging the gap between indigenous and scientific knowledge systems is difficult, because they have different epistemological, methodological, institutional and political stand-points (Adger et al., 2009). For too long, scientific knowledge has been seen as the primary CC information source but the use of this information in adaptation planning has been difficult and it is not often well understood at the local level (Reid et al., 2009). Huq (2011) argues that CC information provided by scientists must build on and incorporate existing coping strategies by respecting and acknowledging that traditional strategies have been developed over generations and often provide the best means to adapt to climate hazards. This being said, indigenous knowledge systems themselves are not perfect, as community members may over-exaggerate recent over past events (Reid et al., 2009), and reminisce and idealise the past over the present (Hirsh, 1992). Indigenous people are better able to take new ideas onboard, when they have been empowered to participate in the development of the CC information that informed these ideas, and can see the benefit of these new practices for their existing livelihood strategies (Boko et al., 2007).

2.4.5. CBA is about empowerment

CBA, as described by academics, researchers and NGOs to date (see Table 2.2), is seen to encapsulate a discourse of community empowerment. It encourages a change in discursive view, away from communities as victims, to communities as vital change agents and endorses a decentralisation of power (opposed to the CC discourses discussed in Section 2.2.3). CBA strongly aligns with the social justice perspective taken in this study (see Section 1.4.3), as in CBA, it matters who wins and loses, who is heard and who is not heard, and how this manifests in intra- and inter-community relations (Reid et al., 2009). This focus of CBA on power, is based on lessons learnt, as only when power relations are adequately considered is community work successful in the long term, and for the most marginalised and vulnerable (Cannon, 2010).

There is broad acceptance that CBA should encapsulate the sentiments housed in this Section: bottom-up, participatory and sensitive to power relations, but CBA operates within a system of managerialism and maintenance of existing power dynamics, where experts are seen to hold the CC

knowledge (see Section 2.2.3). How the field of CBA can be mainstreamed and up-scaled within this system is difficult, particularly if it aims to adhere to the principles described in this section; this will be explored further in Chapters 6 - 11.

2.4.6. The process of planned CCA and CBA

Adaptation can involve autonomous, self-initiated strategies, enacted spontaneously by community members in response to changing weather patterns and/or climate variability (Thornton & Manasfi, 2010), or planned; the focus of my study. Planned adaptation relates to adaptation strategies that are initiated by external organisations to assist communities in responding to climate variability or change (Osman-Elasha & Sanjak, 2008). Peltonen et al. (2010) indicate that planned adaptation is essential, as autonomous adaptation is unlikely to be sufficient as communities face existing burdens, overlaid with the challenges CC poses.

Various commentators and practitioners have delineated planned adaptation into stages, summarised in Table 2.3. There are similarities across all five explanations of the phases of planned adaptation, with Moser and Ekstrom (2010) encapsulating much of what the others contribute. They divide the adaptation process into understanding, planning and managing phases, which is a useful framing that I discuss further in Section 3.3.1. Although phases are useful points of reference for understanding CCA, rarely will adaptation follow a uni-directional and sequential process, in fact adaptation can often be chaotic and iterative (Grothmann & Pratt, 2005).

Table 2.3. Phases of planned adaptation to CC

	Klein et al. (1999)	**Risbey, Kandlikar, Dowlatabadi, & Graetz (1999)**	**Moser and Ekstrom (2010)**	**Leary et al. (2008)**	**Indigo Development[13] (2008, p. 1)**
(a)	Collect information and build awareness	Signal detection	Understand: (a) Detect the problem (b) Gather and use information (c) Re(define) the problem	Learn about the risks and evaluate response options	(a) "Develop an organisational structure for planning (b) Assess system vulnerability, risk level, and capacity (c) Assess likely climate impacts
(b)	Plan and design	Evaluation: interpretation of the signal and assessment of its consequences	Plan: (a) Develop options (b) Assess options (c) Select option(s)	Create conditions to enable adaptation and mobilise resources for adaptation	Develop strategic plan for adaptation
(c)	Implement	Decision and response	Manage: (a) Implement option(s) (b) Monitor option(s) and environment (c) Evaluate	Implement interventions	Implement the plan
(d)	Monitor and evaluate	Feedback: monitoring of the decisions and response		Revise the choices based on new learning	Evaluate performance and changes in risk patterns"

[13] Indigo Development provides CCA strategic planning and capacity building services in the United States of America (see: www.indigodev.com).

The phases of planned adaptation discussed above could equally be applied to CBA; this is clear when one considers how similar they are to the CBA project cycle steps proposed by CARE (2010) (an organisation which has significant experience in implementing CBA) (see Figure 2.3). The first step (Figure 2.3[a]) involves gaining an understanding of the context, which includes social, political, economic, environmental and climatic factors. It also includes understanding what coping strategies are currently employed, and the vulnerability and adaptive capacity of the community concerned (CARE, 2010). The second step (Figure 2.3[b]) is project design, which involves building on the findings of the project analysis to produce project parameters like the scope, aims, strategies and budget that will be employed, but still allowing for flexibility as conditions might change (CARE, 2010). Project implementation (Figure 2.3[c]) is where the capacity of staff and partners is built and where monitoring, evaluation and adjustment of activities is key, while being sensitive to community heterogeneity and disadvantaged groups. While all of these steps are being conducted, CARE (2010) recommends that constant information and knowledge management should occur (Figure 2.3[d]), which involves learning, documentation and knowledge sharing. This essential monitoring and evaluation step must be conducted at all times and should assess the changing adaptive capacity of the community and focus on process-oriented indicators. The information and knowledge management step (Figure 2.3[d]) provides vital resources for improving decision making and operational efficiency (CARE, 2010)

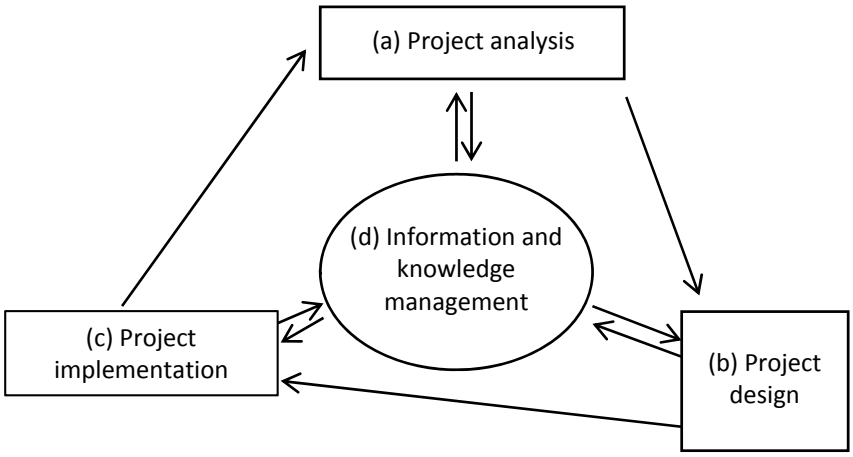

Figure 2.3. The CBA Project Cycle (CARE, 2010)

2.4.7. Successful CCA and CBA

The success of CCA is subjective, and depends on the aspirations (discussed in Section 2.3.2), the scale of the intervention(s), who they are for, who is implementing them and how they are being evaluated (Adger, Arnell, & Tompkins, 2005). It also depends on the framing and approach of CCA (discussed in Section 2.3.1). For example, CCA that aims to promote sustainable development, as opposed to

dealing specifically with CC impacts, will be vastly different in approach and outcome, and hence face different challenges (Klein et al., 2014). Moser and Boykoff (2013b) concur, indicating that there is no clear understanding as to what successful adaptation looks like; the overall conclusion being that success is normative and context-specific. This being said, general criteria which contribute to CCA success have been developed, see Table 2.4.

Table 2.4. Criteria for CCA success

According to Moser and Boykoff (2013b)	**According to Adger et al. (2005)**
Communicate risk effectively.	Effectiveness: meet the defined objectives.
Use risk and vulnerability assessments to guide adaptation priorities.	Efficiency: have a favourable cost/benefit ratio.
Abandon stationarity in management.	Flexibility and robustness: take uncertainty and scale taken into account.
Engage meaningfully with those affected by CC and those planning CCA.	Equity: alleviate present inequalities.
Utilise effective decision support mechanisms which allow science to shape decision-making.	Legitimacy: ensure acceptable to stakeholders.
Systematically assess cross-scale, temporal, social, ecological and sectoral side-effects of CCA decisions.	
Institutionalise and operationalise monitoring, evaluation and learning.	

Moser and Boykoff (2013b) and Adger et al. (2005) concur with regards to successful CCA requiring flexible management and meaningful and acceptable engagement with stakeholders. Moser and Boykoff's (2013b) success criteria align with both the risk management and vulnerability approaches (discussed in Section 2.3.1), and Adger et al. (2005) bring in concepts such as efficiency, equity and legitimacy. Of particular importance in relation to this study's social justice perspective and focus on CBA, is that both papers focus on meaningful engagement with communities, consideration of any side-effects of decisions and alleviating inequalities.

Lessons for successful CBA highlighted by Cannon (2010) are firstly, that 'coping' with disasters and weather events should not be separated from adaptation to longer-term trends in weather. Communication of the cause of these events must be done responsibly, without linking everything to CC, which can lead to mistrust in the science if proved incorrect. Secondly, CBA has a lot to learn from other fields that have been in operation for longer and have had success working with communities. These include disaster risk reduction, community-based natural resource management, poverty reduction, and in the South African context, the community work conducted to deal with the HIV/Aids pandemic (Cannon, 2010). Learning from the successes and failures of these fields will be essential in moving CBA forward (Cannon, 2010; Moser & Dilling, 2007). Lessons from the community-based environmental planning field, include: (a) the need for 'place-based' solutions, as what works in one

area may not work in another; and (b) the importance of developing local 'ownership' of the problems and building consensus in the community, while recognising intra- and inter-community heterogeneity (Measham et al., 2011).

2.5. MUNICIPAL ENABLED CCA AND CBA

At the core of this thesis, I am investigating how four South African municipalities are tackling CCA. Municipalities are the focus of the empirical work because, as is articulate in Section 1.2, they have a vital role to play in ensuring that the communities they serve are able to cope with climatic changes. CCA and CBA will only occur at the scale required, when government, with its vast financial and human resources gets behind it, incorporating adaptation into all tiers of government planning and policy. The theme for the seventh international CBA conference was 'mainstreaming CBA in national and local planning' (Huq, 2012; Suarez, 2012). At this conference, discussions were held on how CBA can move from being implemented mainly by developmental organisations, to being implemented by local government, as the service-delivery hubs of local areas (Sekine et al., 2009). Research is needed to determine what the barriers and enablers are to incorporating adaptation into local government, and it is specifically within this gap, that this thesis is inserted.

Young (2007) describes local government as the nub of climate protection; being well placed to take specific bio-physical and social conditions into account, ensuring that CCA is 'place-based' (Measham et al., 2011). In SA, municipalities are tasked with provided services to their communities in a sustainable manner, promoting social and economic development and a safe and healthy environment, as well as encouraging community involvement in municipal matters (Government of SA, 1996). They govern these and other objectives with support from national and provincial government tiers in a co-operative fashion (Government of SA, 1996).

Municipalities in SA, often hold unfunded mandates and operate under severe financial constraints, with numerous competing priorities (Cartwright, Oelofse, Parnell, & Ward, 2012) and under huge pressure from residents. Municipalities that have been successful in enabling CCA, have: (a) been able to link adaptation to other co-benefits; (b) made CC impacts known to the public; and (c) garnered support from other municipalities and national government (Young, 2007). In these contexts, local champions that reach out to the public and develop creative financing for CCA, are essential (Young, 2007). Pasquini et al.'s (2014) research into what enabled CCA in two South African municipalities, revealed the importance of leadership for CCA mainstreaming. One can assert, that this is particularly the case with regards to CCA in South African municipalities, as the mandate for municipalities to tackle CCA is not clearly set out in any of the policy or legislation that guides the functioning of local government (see Section 2.2.2). This issue is explored further in Chapters 6 - 11.

Up-scaling and mainstreaming are key discussion points within this thesis, due to my focus on municipal enabled adaptation, and the role that municipalities can play in delivering CBA (see Sections 1.2, 2.4.8 and 11.1). One of the challenges facing CBA, is to move it from being implemented in a piecemeal fashion via pilot projects over discrete timeframes, to a mainstreamed intervention for the long-term improvement of community resilience. But scaling out CBA is difficult due to the context-specific nature of adaptive capacity and opportunities for adaptation, and the inherent challenge in retaining community empowerment (Section 2.4.5) as a fundamental principle of CBA (Gogoi, Dupar, Jones, Martinez, and McNamara (2014). Vincent et al. (2010) motivate for the mainstreaming and up-scaling of CBA through its integration into existing or planned development projects instead of the more common 'direct' application of CBA via response to distinct CCA needs (see Section 2.3.1 for discussion of McGray et al.'s [2007] CCA continuum). The 'direct' application of CBA has to date been far more common, however they assert, that 'mainstreaming' CBA into diverse sectors, especially those related to development, is the only way that CBA will occur at the scale required. This mainstreaming will also be enhanced by CBA that is informed by and informs local, regional, national and even global policy (Vincent et al., 2010).

A caution in relation to this call for mainstreaming has come from those arguing that CC needs to be examined as a cultural concept (influenced by its physical science and techno-centric origins), and that the discourse(s) that CC may blindly endorse needs to be questioned (see Section 2.2.3). For example, the managerial discourse which operates strongly in relation to CC, could potentially lead to the promotion of a one-size-fits all solution, which is likely to align with speedy mainstreaming, but will not lead to the reform needed for structural change in response to CC (Arnall et al., 2014).

2.6. CONCLUSION

Chapter 2 contextualises this piece of research by firstly discussing how CC has been dealt with to date in SA, as it is within this country that empirical data collection occurred. Secondly, various framings, approaches, aspirations and outcomes of CCA were considered, leading to the recognition that CCA can be understood in a multitude of ways. How CCA is understood in this thesis is then highlighted. Thirdly, the various tenets of CBA, derived from the literature, were described. Fourthly, municipal enabled CCA and CBA, the focus of this thesis, were discussed. The literature-based contextualisation of CCA and CBA reflected in this chapter is important, as it influenced how I approached the empirical aspects of my study, but only in part. Due to the reflexive nature of this piece of work, the understandings and framings of CCA and CBA as expressed by interviewees were equally seen as legitimate understandings of these concepts. Chapters 10 and 11 bring these various conceptualisations together and reflect on what this means for the fields of CCA and CBA.

CHAPTER 3: DEVELOPING A FRAMEWORK FOR ANALYSING BARRIERS TO PLANNED CLIMATE CHANGE ADAPTATION

3.1. INTRODUCTION AND OVERVIEW OF CHAPTER

This chapter builds on Chapters 1 and 2, by developing a conceptual framework for understanding and analysing barriers to planned CCA and CBA. This framework houses a system of concepts and the presumed relationships between them, as well as the assumptions and expectations that informed my research (Maxwell, 2013). This tentative theory (Maxwell, 2013) of barriers to and enablers of planned CCA and CBA, guided the systematic literature review and case study analysis, and helped me to think about my research objectives.

I begin this chapter by describing the barriers to CCA (Section 3.2), as discussed in the literature, with reference to ways in which they can be overcome and where appropriate, the implications for CBA. I then discuss enablers of adaptation and the interacting nature of barriers and enablers. In Section 3.3 I describe several frameworks of barriers to adaptation developed by other researchers. The literature-based understanding garnered during the development of Chapters 1 and 2, and Sections 3.2 and 3.3 informed the framework developed for this study, which is presented in Section 3.4.

3.2. BARRIERS TO AND ENABLERS OF ADAPTATION

CCA is not occurring at the scale and with the urgency that is required to deal with CC. It is this acknowledgement that has led researchers (such as Jones, 2010; Leary et al., 2007, 2008; Moser & Ekstrom, 2010) to investigate barriers to adaptation, exploring how they operate, overlay and interact, as well as how they can be overcome. In the IPCC's AR5, it is stated with very high confidence that there are substantial barriers and limits to CCA (Klein et al., 2014). Leary et al. (2008) indicate that barriers can manifest in relation to whether CC risk is perceived, once perceived, whether the knowledge exists to adapt to the risks, as well as whether there is the capacity to enact the adaptation. This is influenced by the financial feasibility of the interventions (whether the benefits outweigh the costs) and whether there are the human resources/skills and technology required. Barriers can relate to normative issues such as culture and tradition, and cognitive issues such as perceptions and the psychology of change. Institutional barriers include weak institutions, with ineffective administration and inadequate accountability that provide little support to communities; organisational inertia; and lack of political will (Moser & Dilling, 2007). Barriers also may emerge in relation to limited resources, whether physical, social, human, financial or natural resources. Issues of uncertainty, the complexity of different scales, and heterogeneous communities, overlay these barriers, providing further dimensions to be considered when trying to understand and overcome barriers.

Barriers can be overcome by considerable effort (Moser & Ekstrom, 2010), which can occur through for example: innovative management, a shift in thinking and/or resources, a change in prioritisation, and/or institutional changes. Whereas limits are defined as obstacles to CCA that are absolute (Moser & Ekstrom, 2010). They occur when an actor's objectives or a system's needs cannot be achieved without incurring intolerable risks (Klein et al., 2014). If barriers are not overcome, they affect the efficiency and effectiveness of adaptation. However, caution must be observed if a smooth process with little or no barriers occurs, as this may be due to barrier avoidance, which does not necessarily lead to successful adaptation (Moser & Ekstrom, 2010). Barriers can result from the actors involved in the CCA, from their system of concern (object on which they act) and from the broader context (social, biophysical, economic, governance), or any combination of the three (Moser & Ekstrom, 2010).

Barriers and limits are all influenced by the rate and magnitude of CC (Adger et al., 2007), for example a barrier may become a limit if CC impacts worsen. Barriers and limits are also influenced by how CC impacts are assessed. If, for example, the criteria used are biodiversity loss and loss of life, the types and magnitudes of obstacles are likely to be different to a situation where the criteria are equity and monetary loss (Adger et al., 2007). Barriers are endogenous to society, and are therefore mutable, subjective, socially constructed and based on the values of diverse groups (Adger et al., 2007; Adger et al. 2009). They depend on the goals of the CCA (see CCA aspirations, Section 2.3.2), influenced by the scope and scale at which adaptation is implemented (Adger et al., 2007). They also depend on the agent(s) of CCA, their general disposition and their relationship to risk (relates to the governance lens, see Section 1.4.2) (Adger et al., 2007).

Barriers do not exist on their own; where CCA is being understood, planned and/or implemented, enablers exist. These are those factors and processes that move adaptation work forward despite the significant challenges faced. Klein et al. (2014) in the IPCC's AR5 indicate that enablers have received less research effort than barriers to date, and advocate for research into how these enablers contribute to overcoming barriers. My research responds to this call from the IPCC. Hence, my research considers both barriers and enablers, with barriers receiving more attention in this chapter, as more literature could be sourced on barriers to CCA. Having said that, enablers are seen as equally important, and are discussed, where sources were found, in relation to overcoming barriers (within Sections 3.2.1 - 3.2.9), and within a separate section (Section 3.2.11).

A note to make at this point is that within this field of research, different synonyms have been used for what are termed barriers and enablers in this thesis. Biesbroek et al. (2013) found that words like 'hindrance', 'constraint' and 'obstacle' are often used interchangeably with 'barrier'. Klein et al. (2014) concur, indicating that constraints and barriers are often used interchangeably. In this thesis I have

chosen to use the term barriers and enablers, while the IPCC in its AR5 used the terms constraints and opportunities. I define enablers in alignment with the IPCC's definition of opportunities, as *"factors that make it easier to plan and implement adaptation actions, that expand adaptation options, or that provide ancillary co-benefits"* (Klein et al., 2014, p. 907). I see opportunities as those things that arise as a result of CC, which are advantageous to a community. An example being if increased temperatures in a cold region of the world open up tourism opportunities.

3.2.1. Knowledge and communication barriers

I begin by discussing what I have grouped into knowledge and communication barriers. I found four issues related to this group of barriers: (a) The information required for adaptation is not available (Section 3.2.1.1); (b) clash of knowledge systems (Section 3.2.1.2); (c) CC science uncertainty and complexity (Section 3.2.1.3); and (d) ineffective communication of CC knowledge (Section 3.2.1.4). These four groupings are discussed below.

3.2.1.1. The information required for adaptation is not available

When information that is required for CCA is not available or withheld, knowledge barriers exist. Often marginalised communities do not have the education or networks to receive the climate related information they need (Erikson, 1996). If knowledge is not relevant to a certain context it can lead to mal-adaptation, because information that enables adaptation in one area or for one group of people may not be feasible elsewhere. Huq (2011) believes that an improvement in climate science for the production of location-specific impacts, and presenting CC information in an accessible and appropriate format for community interpretation is vital to improving CBA. This is a challenge, particularly in Africa, where there is a shortage of climate scientists that can produce and disseminate CC projections for the African context (Patt, 2009).

3.2.1.2. Clash of knowledge systems

According to the IPCC (2012), there is high agreement that integration of local knowledge with scientific and technical knowledge can improve disaster risk reduction and CCA. Local communities document their experiences with a changing climate, particularly extreme weather events, in many different ways, and this self-generated knowledge can uncover existing capacity and shortcomings (IPCC, 2012). To achieve this integration, information providers need to be humble and have the spirit of partnership, being ready to learn from local communities and work with them in developing actions that are useful and have a real chance of being adopted and owned by the community (Huq, 2011). A challenge being that many scientists do not believe that the two knowledge forms can meld easily, due to their epistemological and methodological differences (Adger et al., 2009). Integrating formal

(scientific) and informal (indigenous/local) knowledge is of utmost importance for CBA, and hence this barrier has particular relevance to CBA (see Section 2.4.4).

3.2.1.3. CC science uncertainty

Scientific uncertainty is a barrier to CCA and CBA, as at present climate science is not able to accurately predict CC impacts for specific localities. There are fundamental and irreducible uncertainties in climate projections, which result from limitations in climate science knowledge and downscaling uncertainties (Dessai & Hulme, 2004 as cited in Adger et al., 2009). Downscaling uncertainties are exacerbated by the numerous methods and models for downscaling, the randomness of the climate system, and the fact that exact human actions, which influence the modelling of CC, cannot be projected without uncertainty (Dessai & Hulme 2004 as cited in Adger et al., 2009). Dessai et al. (2009 as cited in Adger et al., 2009) assert that inaccurate and imprecise knowledge of future climate is not an absolute limit to adaptation, because robust decisions can be made with imperfect climate projections, and perhaps climate projections should not be a central requirement in CC decisions (Adger et al., 2009). Adger et al. (2009) argue that decisions that will be beneficial across a number of potential climate futures are often the most robust, and more likely to acquire political will or behavioural intent, as they do not have potentially irreversible negative consequences (Adger et al., 2005 as cited in Moser & Ekstrom, 2010). To make these robust decisions, Hallegatte (2009) recommends using: (a) scenario analysis, and choosing the solution that is the most insensitive to future climatic conditions; (b) including robustness as a criterion in multi-criteria decision-making processes; and/or (c) applying the precautionary principle in decision making.

3.2.1.4. Ineffective communication of CC knowledge

Communication barriers are strongly linked to knowledge barriers and are therefore grouped together, with communication being the vehicle through which knowledge/information is transferred and understood. Communication enables exchanges of ideas, feelings, and information and allows people to develop forms of shared understanding and visions of a desirable future (Moser & Dilling, 2007). It is thus a vital enabler or resistor of change. Communication of CC determines how the climate science and CC messages (CC knowledge) are received, understood and utilised by academics, scientists, practitioners and society.

Communication barriers occur when CC information is not translated into formats that suit different end-users (e.g. engineers, local government decision makers, farmers), who require that CC information is presented in formats, applicable to certain timeframes and relating to specific CC variables (Ludwig, 2009). Even if the communication of CC is effective, it does not necessarily lead to action; this being described as a 'deficit model' (Adger et al., 2007), where attaining more information

becomes a substitute for action (Moser & Dilling, 2007). For communication to lead to action, it must be responsive to internal ('agency') and external ('structure') barriers to behavioural and social change (Moser & Dilling, 2007). Hence, communication must take into account what people can actually do to adapt - their social and cognitive characteristics - and what options are available to them (Moser & Dilling, 2007). Moser and Dilling (2007) recommend moving CC communication away from trying to convince people of the validity of the problem, which requires physical science, to appealing to individual's rational side and communicating messages that appeal to people's emotions, which requires social science. This solution is built on the knowledge that information is always filtered through a set of personal and societal values, priorities and experience, and only when certain thresholds are met within those filters will action be taken (Irwin & Wynne, 1996 as cited in Adger et al., 2007). As Dunwoody (2007) puts it, experience matters more than information, making effective CC communication complex, as thresholds and experiences differ between and within communities.

Research on communicating CCA is still in the early stages, and is complicated by the fact that a variety of words (CCA language is often not used at all) are used when speaking about CCA (Moser, 2014). Despite the infancy of this field of research, we know that CC messages related to fear and guilt, have stimulated limited action (Moser & Dilling, 2004 as cited in Adger et al., 2007). Hence, Moser and Dilling (2007) motivate for consistent communication that is personally relevant, practical, and focused on solutions, not problems (Moser & Dilling, 2007). These solutions need to be believable, inclusive and meaning-giving to inspire charismatic leaders to drive action in their communities (Moser, 2007). Visual tools (Nicholson-Cole, 2005 as cited in Adger et al., 2007) and interactive games (Suarez, 2012), have been useful in this regard.

3.2.2. Financial barriers

Funding is needed for adaptation, especially in developing countries. CC negotiators therefore attempt to split development finance from additional adaptation finance, despite Fankhauser and Schmidt-Traub's (2010) argument that in practice the split between development and adaptation interventions is arbitrary and counters mainstreaming of adaptation into development, which decreases transaction costs and takes advantage of synergies between the two fields. However, Kiratu (2011) and Pressend (2011) indicate that existing funding for adaptation (whether additional to or incorporated within development funding) is simply not enough, and more funding is needed from developed countries for developing countries, so as not to burden developing countries' public expenditure and budgets (Kiratu, 2011). Füssel (2007, p. 265) states that:

> *It is particularly difficult to ensure that international assistance for adaptation would be fully additional to official development assistance, because there is no binding level for the latter.*

Such additionality is a key requirement for recipient countries in any international adaptation regime, because their vulnerability to CC would not be improved by a mere relabelling of development assistance.

International CC law states that climate finance must be in addition to funding that would have been disbursed for other objectives, but there is no clear definition or consensus as to the definition of additionality (World Resources Institute, 2010). There thus appears to be a disjuncture between the requirement of additionality and the growing call for CC actions to be incorporated into development (see Bizikova et al., 2007). Linked to this discussion would be whether projects that seek out this international CC funding would then need to prove that the interventions are specific to CC and additional to developmental interventions that have CC benefits. This is a challenge as *"sustainable economic development is a critical foundation for the creation of adaptation opportunities, because it has the potential to build the capacity of individuals and organisations to adapt"* (Klein et al., 2014, p. 909). A further issue, highlighted by Kiratu (2011) is that external funding for adaptation in developing countries often results in project-type investments, leading to: (a) lack of continuity for good programmes; (b) lack of domestic investment and buy-in; and (c) local models or ways of doing things being overlooked (Kiratu, 2011).

Much of what is discussed above relates to top-down approaches of unlocking finance for CCA, but as has been articulated in Section 2.4.1, bottom-up interventions are better suited to the needs of the communities that CCA finance aims to support. Christensen, Raihan, Ahsan, Uddin, Ahmed, & Wright (2012) indicate that to make CC finance effective for the most vulnerable requires that the recipients of the funding, not the donors, decide how the funding is used. Mechanisms should be created so that communities, not just national governments, can access international funding. They argue that local governments play an important role, serving as *"key elements of a bottom-up approach and as gateways to help communities' access financial resources for adaptation"* (Christensen et al., 2012, p. 28).

3.2.3. Technology barriers

Technology, although discussed to a greater extent in relation to mitigation, has a role to play in dealing with the impacts of CC, for example in relation to water conservation technologies, the development of drought-resistant seeds, and energy efficient cooling technologies. Technology barriers relate to technology not being available, affordable and/or adequate for the context in which it is being implemented. There are various barriers to the development and transference of climate-smart technologies to developing countries. Kiratu (2011) discusses how intellectual property rights provide a disincentive for research and development to be disseminated, and provide obstacles for

the general public to access the latest innovations. Even the Trade-Related Aspects of Intellectual Property Rights (TRIPs), which make provision for the transfer of knowledge and technology from developed to developing countries, hinder this flow via high licensing fees and royalty payments (Kiratu, 2011). These issues lead to developing countries, like SA, purchasing large portions of its green technology (albeit mainly mitigation-linked technology) from other countries, even though the manufacture of green technology is a developmental opportunity for SA.

3.2.4. Human resource barriers

Klein et al. (2014) highlight the essential, albeit under researched role that human resources play in enabling CCA. There is a strong relationship between the strength of human resources and the adaptive capacity of a community. Communities with strong leadership and organisational environments tend to be able to adapt to CC more successfully (Klein et al., 2014). Lack of leadership at all scales and a general lack of CC skills, especially for the interpretation and understanding of CC projections, are examples of human resource barriers (Mukheibir, Kuruppu, Gero, & Herriman, 2013).

3.2.5. Cognitive barriers

Cognitive barriers, although rarely discussed in relation to SESs, have a profound effect on their workings (Lynam & Brown, 2011). They occur when what people believe, what they think about issues and how they process information received, runs counter to CCA and/or CBA action (Moser & Dilling, 2007). Post the 2000 floods in Mozambique, Patt (2009) found that Mozambicans resisted being moved out of the flood-plain, despite having recently experienced the devastation of the flood, as they perceived other risks such as crime and economic difficulties as more important. Hence, cognitive barriers relate to perceptions which lead to CCA not being prioritised.

Cognitive barriers also exist when people do not trust the CC related information received, and/or have negative emotional responses to that information (Moser & Dilling, 2007). Adger et al. (2009) assert that if individuals do not perceive their behaviour in relation to the impacts their behaviour causes, if they do not perceive the risk of CC as something requiring action, or if they feel powerless to do anything about the perceived risk, then complacency and lack of CCA action will occur. Certain perceptions can be held by an entire society, by a group of people within a certain culture, by a family or household, or by individuals (Adger et al., 2007). Perceptions held across different scales, change over time and interplay, adding to the complexity of this barrier (Adger et al., 2009).

Oppenheimer and Todorov (2006 as cited in Adger et al., 2007) purported that CC decisions are influenced by individual and social perceptions of risk, social opinions and values. As indicated above in relation to flooding in Mozambique, perceptions of the risk that CC poses, will determine the priority

people give to CC actions. Grothmann and Patt (2005) indicated that risk perception is influenced by the appraisal that an individual makes as to the risk probability and the damage it may cause, this being influenced by discourses held individually and collectively (hence cognitive barriers overlay with discursive barriers). They asserted, that people tend to underestimate large probability risks and over-estimate small probability risks. Perception of adaptive capacity is also important in determining whether action is taken, and is influenced by the appraisal of one's ability to avoid harm and what the cost of that action will be (Grothmann & Patt, 2005). People tend to under-estimate their adaptive capacity, due to CC being perceived as a global problem that individuals can't do much about (Grothmann & Patt, 2005). If an individual or community sees themselves as unable to enact adaptation due to barriers, whether barriers exist or not, adaptation will not occur. Therefore, based on both risk perception and perception of adaptive capacity, adaptation, no adaptation or mal-adaptation can occur (Grothmann & Patt, 2005).

If individuals do not feel that an issue, such as CC, is their problem or responsibility, action will not occur. Apathy results when the magnitude of the problem makes people think that government must enable all interventions, often combined with a shifting of the blame from the individual to large corporations or nation states (Moser & Dilling, 2007). However, if a person has experienced an impact, their perception of that impact is heightened, and they are more likely to adapt to that impact in the future (Grothmann & Patt, 2005). Kuruppu and Willie (2015) found that in small island developing nations, cognitive barriers related to how adaptation assessments and plans failed to into account the following: (a) community perceptions of CC risks; and (b) how community beliefs and values shape CCA decisions. In an overlay with discursive barriers they also indicated that international discourses related to climate refugees and migrants influenced community perceptions of their agency and ability to deal with CC (discussed further in Section 3.2.8).

3.2.6. Normative barriers

Normative barriers relate to the norms that shape behaviour, which are influenced by tradition and culture (Jones, 2010), and are important because they determine acceptable and unacceptable actions (Jones, 2010). If legislation, regulations, plans, policies and/or projects fail to align with norms held by individuals and communities, they are often not socially accepted, do not bring about social change, and are unlikely to have the desired effect (Tompkins & Adger, 2005). Normative and cognitive barriers overlap significantly, especially in relation to how beliefs and norms are interlinked, illustrated in the following example. Patt (2009) described how community members in Mozambique believed that crop failures had occurred because they had not followed traditional farming practices and had therefore upset their ancestors' spirits. They could not be convinced of the role of changing weather

patterns in the crop failures. Although these cultural beliefs counter CCA action, forcing or imposing cultural changes is generally considered unethical (Jones, 2010).

However, cultures can be shifted via 'issue cultures', which are created when there is a 'cultural whirlwind' (Ungur, 2007). A 'cultural whirlwind' occurs when consecutive events all linked to one issue occur and attract attention from a community or communities (Ungur, 2007). In relation to CC these could be consecutive climatic events, which Moser and Dilling (2007) call 'teachable moments' or 'windows of opportunity'. Hence, Ungur (2007) asserts that if the extreme events that occur around the world could be directly linked to CC, this would provide impetus for action. However, one could question whether recognising that events happening elsewhere are linked to CC, will enable action, or whether a form of the 'deficit model' (discussed in Section 3.2.1), will occur. It may also default action towards more reactive responses, where experience of CC impacts is required before action is taken, as opposed to more radical and forward looking action. What has been discussed above again reveals the overlap between cognitive and normative barriers, in how risk perception can influence norms.

If there are cultural practices within a community used for coping and adapting to climate variability, such as flexibility and/or livelihood diversity (Patt, 2009), CCA can build on these initiatives (Ensor & Berger, 2009). When a community shares norms, and has strong cultural and traditional ties, and high levels of social capital (Adger, 2003) ("*the norms and networks that enable people to act"* [Woolcock & Narayan, 2000, p. 226]), action is more likely to occur. Collective action relies on: (a) trust between community members; (b) those calling for the action having a good reputation and engaging in reciprocal action; (c) strong institutions; (d) the decision-making group being fairly homogenous; and (e) fair distribution of the management benefits (Adger, 2003). The actions also need to be socially acceptable and fit within wider issues, such as economic development and social evolution (Adger, 2003). Of interest, in relation to SA, with its social grant system, is that it has been found that welfare systems counter collective behaviour, and that if a society has high levels of social capital, the need for government assistance is lessened (Adger, 2003).

3.2.7. Organisational barriers

Unlike Jones (2010), I delineate social barriers into cognitive, normative and organisational barriers, as opposed to cognitive, normative and institutional barriers. I do this because firstly, the focus of my research is on municipalities which are formal organisations. Organisations being *"the collective units, embodying institutions, that are vehicles for adaptation"* (Pelling, 2011, p. 62). Secondly, because I found it difficult to separate institutional and normative barriers; institutions being defined as *"the formal legal rules and informal social norms that govern the behaviour and shape how individuals and*

organisations interact" (Berman, Quinn, & Paavola, 2012, p. 87). Hence, I have separated out the more formal rules and structures of organisations that hinder CCA and CBA, defined here as organisational barriers, from the more informal rules, norms and behaviours that hinder adaptation, defined here as normative barriers (Section 3.2.6). Berman et al. (2012) illustrate the overlap between normative and organisational barriers (as defined here) by stating that rules, norms and beliefs enable, constrain or exclude certain actions and behaviours, which are also shaped by the broader context of externally-directed policies and processes.

Organisational barriers occur when competing agents and interests within an organisation lead to coordination issues (Pelling, 2011). They also occur when organisations face difficulties in dealing with CC, which operates under long timeframes, with inherent uncertainty (Keeney & McDaniels, 2001 as cited in Tompkins & Adger, 2005) and complexity. Responding to issues with flexibility, reflection, learning, experimentation and innovation is difficult for formal and structured organisations (Pahl-Wostl, 2002 as cited in Huntjens et al., 2012). The planning timeframes of organisations are often inept at dealing with the long-term nature of CC, and may lead to short-term adjustments for coping instead of what may be best for SESs, which is a focus on long-term solutions and sustained adaptation (Thornton & Manasfi, 2010). A focus on 'low-hanging fruit' interventions that can be enacted early and with ease is likely to endorse business-as-usual practices and create lock-in, as opposed to motivating for long-term transformational changes (Moser & Dilling, 2007). However, Leary et al. (2008) motivate for a focus on present climate hazards and narrowing the present adaptation deficit by integrating CC with development, before longer term CCA initiatives are tackled. This to produce immediate benefits, build momentum and mobilise resources timeously (Leary et al., 2008).

Tompkins and Adger (2005) suggest an adaptive management approach, which endorses learning-by-doing and an iterative decision-making process. They advocate for an 'act then learn' process of decision-making under uncertainty (Nordhaus, 1994 as cited in Tompkins & Adger, 2005), and indicate that by starting small and assessing the success of the decision, one can avoid mal-adaptation (Tompkins & Adger, 2005). This approach, although ideal, incurs temporal and financial costs that organisations in developing countries can often ill-afford (Tompkins & Adger, 2005). Also, flexibility, reflexivity, and learning-by-doing are in many ways in direct contrast to what an organisation aims for: maintenance of stability (Moser & Dilling, 2007). Organisational change is often needed to enable flexible CCA, but this is tough, as it incurs financial costs, and challenges the existing culture, where institutional inertia often exists, both within the structure and its membership (James, Smith, & Doppelt, 2007). James et al. (2007) found that if advocacy, regulation changes, inspired leadership, shifting ethics/values, and/or the need to enhance competitive advantage occurred, organisations are

more likely to change. This being said, Hulme (2007 as cited in Arnall et al., 2014) presents a caution with regards to the focus on flexibility, as it can lead to the endorsement of an endless list of options, without questioning whether by incorporating all, the core values of CCA and/or CBA are lost.

3.2.8. Discursive barriers

In Section 2.2.3, discourse is defined, and global CC discourses discussed, in relation to SA, as well as barriers related to these discourses alluded to, i.e. global discourses which have little local relevance and disempower those most vulnerable to CC (Adger et al., 2001). Discourse influences where money goes; for example, if a funding model follows the vulnerability approach (Section 2.3.1), then the most vulnerable communities will receive funding preferentially. Drawing on Section 2.2.3, discourse influences what is seen as successful adaptation, whose values are most important, who influences decisions (power relations) and what is prioritised. Discursive barriers occur when a dominant discourse is accepted, without recognition of its shortfalls and its applicability to the local context.

Poor people in general, are often branded as unable to make the changes required to deal with CC impacts (Patt, 2009). This is especially the case when income is related directly to the ability to adopt flexible strategies for CC, without adequate acknowledgement of how influential governance, education and health status are on adaptive capacity (Patt, 2009). When poor women in developing countries are viewed as victims of CC, they are then viewed homogenously as unable to cope with CC without external, developing country assistance, which perpetuates the CC problem for 'them' and not for 'us' (MacGregor, 2010). A linked discursive issue relates to the uncritical acceptance of CC as a scientific issue that requires positivist approaches to be understood and managed (MacGregor, 2010). Both these discursive viewpoints move us away from seeing poor communities as agents of change and recognising the value that community knowledge can bring to the CC table, essential for CCA and especially CBA (see Section 2.4).

Furthermore, these discursive viewpoints lead to *"learnt dependency"*, where the poor, marginalised and vulnerable become contracted to receive through sustained giving, disempowerment, and humiliation; which results in a loss of humanity (United Nations Department of Economic and Social Affairs, 2013, p. 25). All of these are strongly opposed to the principles of CBA (Section 2.4) and social justice (Section 1.4.3). The United Nations Department of Economic and Social Affairs (2013) indicate that empowerment by overcoming poverty cannot be achieved, if overcoming poverty is only linked to defeating material deprivation. It has to also be linked to ensuring that basic human rights are received, that barriers to justice and equality are overcome, and that those who hold the power are held accountable (United Nations Department of Economic and Social Affairs, 2013).

3.2.9. Physical barriers

Due to the governance and social justice underpinnings of this thesis, as well as the fact that barriers to and enablers of human-induced municipal planned CBA is the focus of this study, physical barriers are not expected to play a significant role. However they are important, as they shape what decisions authorities like municipalities can make and what options are available to community members, and hence are included in my framework and defined here. Physical barriers relate to how geographical features (e.g. mountain ranges, coastlines, rivers) hinder migration that may need to occur in response to climatic changes (Klein et al., 2014), and/or species ability to move or adapt to conditions *in situ* (influenced by temperature and rainfall thresholds). They represent natural limits to CCA, such as ecosystem thresholds and geographical limitations (Jones, 2010). Human adaptation is also affected by the ability of human and ecological infrastructure to deal with CC, e.g. the ability of sea walls or coastal forests to protect a community from sea level rise.

3.2.10. Enablers of adaptation

Enablers are understood in this thesis to be *"factors that make it easier to plan and implement adaptation actions, that expand adaptation options, or that provide ancillary co-benefits"* (Klein et al., 2014, p. 907), defined as opportunities by the IPCC (AR5). Gogoi et al. (2014, p. 368) indicate that *"networks and partnerships; documenting evidence and learning; strong adaptive capacity; and deployment of cost-effective institutional channels and finance mechanisms"* are important enablers for scaling up CBA, whether enabled by municipalities (the focus of this thesis) or not. The importance of partnerships in enabling local level adaptation is well illustrated in the case of Cartagena, Columbia. Despite the different political and economic dynamics of Cartagena, as compared to South African cities/towns (the focus of this thesis' empirical work), a useful lesson for enabling adaptation can be taken from this Columbian city. City government, research institutes, NGOs, and the business community brought their diverse and often complementary knowledge and skill sets together, to achieve a better understanding of climate impacts and integrate these considerations into policy (Gogoi et al., 2014).

Other enablers discussed by Gogoi et al. (2014) include interventions that: (a) strengthen adaptive capacity via provision of multiple benefits; (b) ensure that community priorities are adequately recognised; (c) address power imbalances; and (d) promote two-way knowledge sharing between 'experts' and community members (which aligns with the CBA principles discussed in Section 2.4). They also discuss how documented successes and failures of developmental interventions can also provide lessons for CBA. For government to implement CBA at scale, they assert that political will, as well as competent and decentralised institutions and governance, are necessary. They go as far as to

argue that for CBA to be community-driven, decision making and management needs to be done by the community itself. This requires decentralisation of decision making and management, flexible institutional and funding structures, and allowing culture and community held norms to influence the outcomes of CBA (Gogoi et al., 2014).

3.2.11. The interactive nature of barriers to and enablers of adaptation

Categories of barriers are useful for analysis and explanation, but in reality barriers and enablers overlay and interact. In researching barriers to adaptation, I can hypothesise the following overlaps between barriers, but expect many more to be discovered when conducting the systematic literature review and case study analysis. Knowledge and communication barriers are likely to overlay significantly with the ability of human resources to be able to access, interpret and communicate information effectively. CC uncertainty (a knowledge and communication barrier) is likely to be influenced by cognitive barriers in relation to how CC science and its uncertainty is perceived (including perceptions of how perfect the CC information needs to be before action is taken). Financial barriers are likely to overlay significantly with organisational rules, which will determine how funding is sourced, disbursed and managed. The overlay between cognitive, normative, discursive and organisational barriers is significant; how we perceive things is influenced by the formal and informal rules that operate within the context within which we exist, which overlay too with the values and worldviews in operation.

Real world examples of these overlays are exemplified in the work of Chess and Johnson (2007), who reported on a project that aimed to encourage households to boil their water in Peru. The health workers conducting the work were perceived to be spies as they did not follow the correct routes of communication - they focused on the lower status individuals in the community and communicating information that did not align with the community's belief systems - which led to the community not trusting the information they were given. These issues are indicative of the overlay of normative, cognitive, and knowledge and communication barriers. An example of how enablers overlay occurred when a grassroots group in Kenya was trying to stop woman's genital mutilation. They took time in learning to understand the values, cultures and motives of the communities they were working with, and successfully used clergymen to convince those enacting these activities of the dangers of such (Chess & Johnson, 2007).

3.3. FRAMEWORKS OF BARRIERS TO ADAPTATION IN THE LITERATURE

3.3.1. Moser and Ekstrom's (2010) framework

Moser and Ekstrom (2010) developed a framework for understanding barriers to planned adaptation, which relates barriers to a decision making process (Figure 3.1). They divide the adaptation process into various steps within three phases: understanding, planning and managing. They indicated that to move beyond the understanding phase, a minimum threshold of concern and the need for a response must be met. Common barriers that occur in the understanding phase largely relate to what I discuss as cognitive, normative, organisational, discursive, and knowledge and communication barriers. They include: (a) lack of perception of the issue; (b) once perceived a lack of concern and need for a response; (c) lack of accessible, relevant and trusted information available to achieve the necessary understanding; and (d) relevant actors having different understandings of the issue, leading to disagreement on how to deal with it (Moser & Ekstrom, 2010).

Within the planning stage, Moser and Ekstrom (2010) assert that leadership is required to drive the adaptation response as well as agreement on a feasible process to be followed (aligned with human resource and organisational barriers). Within the managing phase, implementation requires intent, resources, ability, momentum and willingness to act, as well as a monitoring and evaluation plan and system (aligned with virtually all the barriers discussed in Section 3.2). Effective response and learning in relation to the monitoring and evaluation system, requires willingness to learn and flexibility.

Ziervogel and Parnell (2014) indicate that often barriers emerge more distinctly when attempting to translate policy into practice. Reflective of this point, is that Moser and Ekstrom (2010) found during case study analysis that most cases had not reached the managing phase; either due to the CC issue only recently being identified or due to barriers experienced. From this work, they drew out four enablers for overcoming barriers to adaptation, which exacerbate or compensate for one another:

1. Leadership: For guidance, motivation and vision.
2. Resources: Financial and human.
3. Communication and information: Availability and accessibility. The information must be understood, trusted and frequently received.
4. Values and beliefs: Consideration of cognitive/mental filters such as perceptions, attitudes, culture and interpretations of risk.

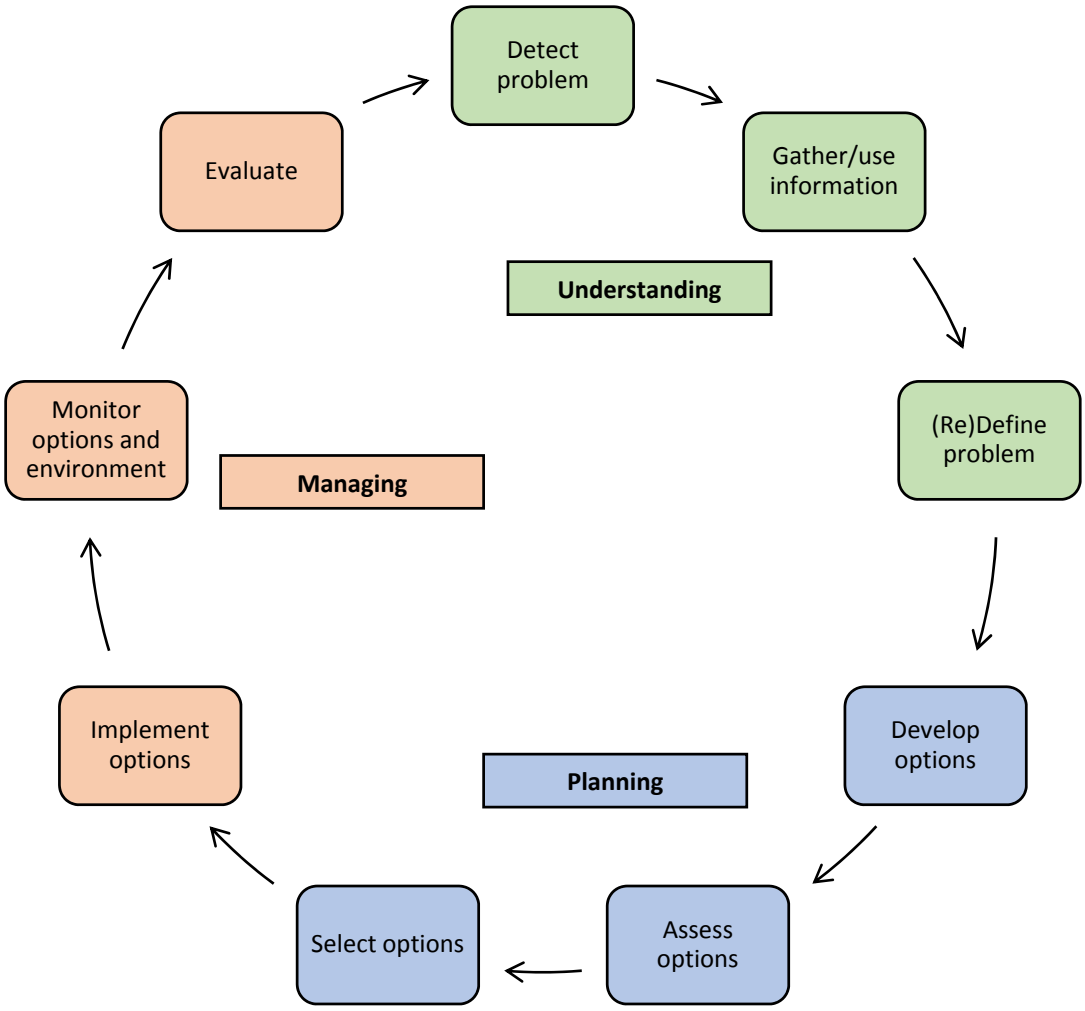

Figure 3.1. The adaptation process according to Moser and Ekstrom (2010), redrawn based on Figure 2, pp. 22027

Another important contribution that these authors make is to indicate that barriers are influenced by not only where they occur in the process of adaptation, but also by their spatial and temporal attributes, as well as the actors, context and system of concern of the adaptation. Spatial attributes relate to whether decisions that affect adaptation are proximate: in reach of the actors, or remote: out of the actor's reach. Temporal attributes relate to whether the decisions which affect the barriers are contemporary: made within the present, or legacy: made in the past. This approach to understanding barriers to adaptation is useful, as it assists in recognising where the barriers are situated temporally and spatially, which is important to consider when attempting to overcome barriers (Ekstrom, Moser, & Torn, 2011).

Moser and Ekstrom's (2010) framework is useful in understanding where the bottlenecks are in the process of adaptation, which will assist in more rational allocation of time and resources, and has been

used to frame a comprehensive study of cross-scale barriers to CCA in Australian municipalities (Mukheibir et al., 2013). Although viewing CCA as a process is convenient, it must be noted that real-world decision making is often not linear or logical, but messy and iterative (Ekstrom et al., 2011). Based on this understanding, I have decided to group barriers based on their attributes, as opposed to linking them to an adaptation process, as Moser and Eksrom (2010) did. This being said, their contributions, as discussed in this Section, are represented in my framework via acknowledgement of scalar issues and their adaptation process will be born in mind when analysing my case study results.

3.3.2. Eisenack and Stecker's (2012) framework

The second framework I considered, focused on analysing CCA as actions, with barriers included in the analysis (Eisenack & Stecker, 2012). Eisenack and Stecker (2012) delineate the exposure unit, operator and receptor when CCA is enacted. The exposure unit represents the SES that is influenced by climatic conditions and responds to stimuli, the operator enables the adaptation and the receptor, receives the adaptation. Hence, in relation to my study's focus, the operators would be the municipal stakeholders (and in eThekwini Municipality and Chris Hani District Municipality's case, the municipal and NGO stakeholders), and the receptors would be the communities within which the adaptation interventions are implemented. The three 'actors' interact and influence how the barriers to adaptation play out. This actor-centric framework aligns well with my study's focus on socio-institutional and governance issues (Section 1.4.2). It also adds weight to the inclusion of human resource (Section 3.2.4) and organisational barriers (Section 3.2.7) within my framework, as the organisations and the people working within them, influence whether CCA and CBA occur and how they occur.

Eisenack and Stecker (2012) highlight four barriers in relation to these 'actors' (see Table 3.1) and indicate that the availability of finances, knowledge, social networks, information and legal power, assists in overcoming them.

Table 3.1. Barriers to CCA as presented by Eisenack and Stecker (2012)

Barrier	**Explanation of barrier**
(a) Missing operator	No one is enacting the adaptation, often due to ignorance of the impacts.
(b) Missing means	The need to adapt is acknowledged but the required means are not available.
(c) Unemployed means	The means are available, but not used, often because of perverse incentives.
(d) Complex actor relations	Interactions between actors are so complex that decisions are not made, or institutions are not equipped to deal with a complex phenomenon like CC.

Barrier (a) in Table 3.1 aligns with barriers within Moser and Ekstrom's (2010) understanding phase of adaptation, and with cognitive and knowledge and communication barriers discussed in Section 3.2. Barrier (b) and (c) would be experienced in Moser and Ekstrom's (2010) planning phase; with barrier (b) relating to financial, human resource and technology barriers (Section 3.2), barrier (c) to organisational, normative and/or discursive barriers (Section 3.2). Lastly, barrier (d) relates most strongly with organisational barriers, which are overlaid with normative, cognitive and/or discursive barriers (Section 3.2). It could align with any of Moser and Ekstrom's (2010) phases. Like Moser and Ekstrom's framework (Section 3.3.1), this framework is not directly represented in the visual representation of my framework (Section 3.4), but has been aligned with it, to ensure that my framework considers the full breadth of barriers discussed in the literature.

3.3.3. Jones' (2010) framework

A third framework for understanding barriers to adaptation was produced by Jones (2010), who grouped barriers into three inter-related categories: human/informational, natural and social (see Figure 3.2). Jones' (2010) framework has influenced my framework, in terms of how grouping barriers assists in their identification and recognising the linkages between them (see Figure 3.2 and 3.3). Jones (2010) groups knowledge, technological and economical barriers into a human and informational category. Whereas I group knowledge and communication, technology and financial barriers into a category called resource barriers, and I also include human resource barriers within this category. Social barriers in my framework include cognitive, normative, organisational and discursive barriers, as opposed to cognitive, normative and institutional barriers, as Jones' (2010) does. The last category, what Jones' (2010) calls natural barriers and I call physical barriers (Section 3.2.10), includes physical and ecological barriers to adaptation (Section 3.2.10).

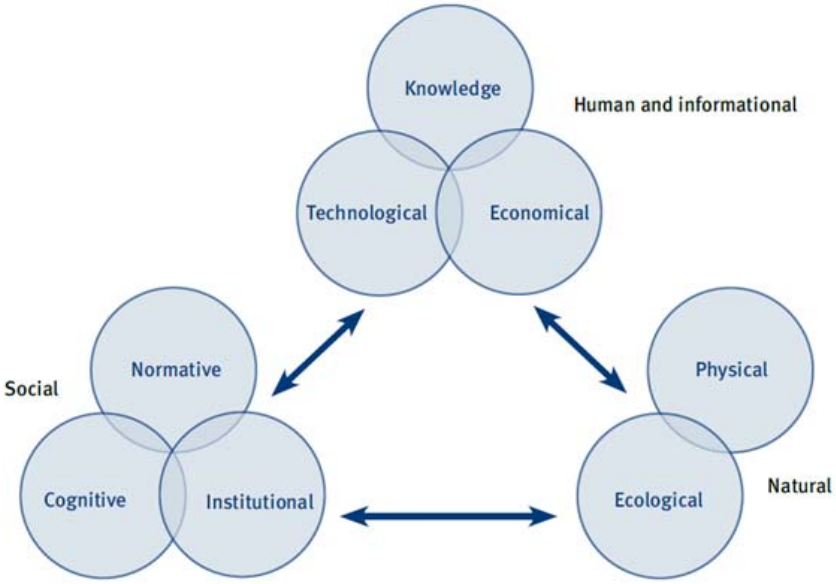

Figure 3.2. Conceptual grouping of barriers to CCA according to Jones (2010), this Figure was reproduced from Jones (2010, p. 3)

3.3.4. The IPCC's (2014) risk-based framework

Post the development of my framework (Section 3.4), the systematic literature review (Chapter 4) and much of my case study analysis (Chapter 6 - 9), the IPCC released its AR5, which housed a risk-based framework for assessing CCA barriers (which they call constraints) and enablers (which they call opportunities) (Klein et al., 2014). The essence of the IPCC's framework is that barriers and enablers must be assessed in relation to managing risks, so that risks remain within a range that is tolerable to the target audience (Klein et al., 2014). This is a useful contribution, specifically in relation to my study, as municipalities are in the business of managing the risks that their residents face. Aspects of this important piece of work have been discussed in my Part I chapters, in relation to their risk approach, their definition of terms, and certain barriers. However, it would be a misrepresentation of the research process I followed to present their framework here and indicate that it influenced the development of my framework, prior to the work presenting in Chapters 4 - 9. I therefore note their contribution and reflect on their findings in relation to my research throughout this thesis.

3.4. FRAMEWORK DEVELOPED FOR THIS STUDY

The framework developed for this study, and presented visually in Figure 3.3, reflects my understanding of the multiple and interacting barriers to CCA, which operate when adaptation is planned and implemented at the local level. A nested representation of the local context was chosen due to the fact that provincial, national and international contexts interact with the local context. The context of local level adaptation is influenced by organisations at higher levels, which are in turn

influenced by how prepared municipalities and communities are to deal with CC (Stafford Smith et al., 2011). Municipalities interact across national, provincial, and local levels (Ziervogel & Parnell, 2014), where the governance systems at each of these levels can buffer or amplify barriers and enablers experienced by municipalities (Pereira & Ruysenaar, 2012).

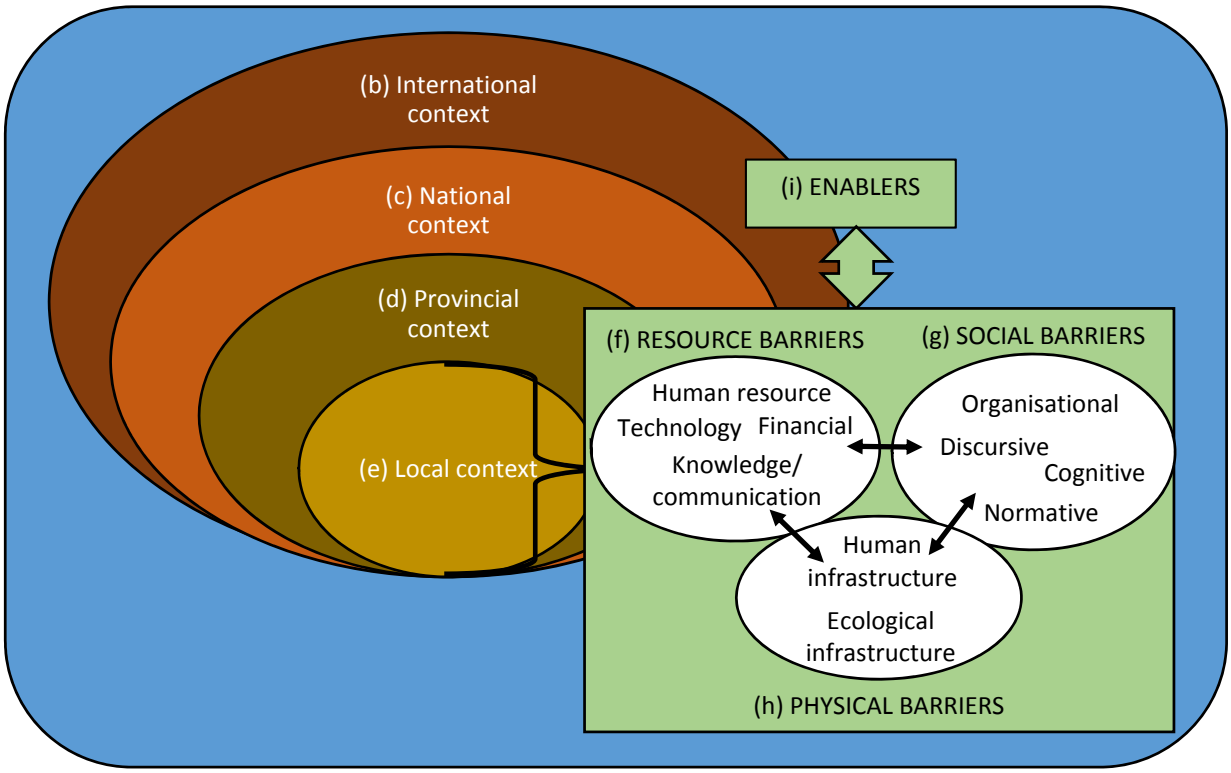

Figure 3.3. Conceptual framework: Barriers to planned CCA

Barriers are grouped into resource, social and physical barriers, (informed by Sections 3.2 and 3.3, see Figure 3.3[f-h]) and interact with enablers (which will be investigated in an inductive fashion via case study analysis) (Figure 3.3[i]). Although highly interlinked, resource and social barriers relate more to social institutions and the behaviour of individual actors, as discussed by Rammel et al. (2007). Physical barriers, relate to the natural resource base (as per Rammel et al., 2007), but also to human-made infrastructure and its ability to deal with CC impacts.

Resource barriers (Figure 3.3[f]) refer to entities that when not available, hinder the planning and implementation of adaptation. These barriers can be easier to describe and analyse than social barriers, as they are often more intuitive, because they are assets that can be drawn on by a person or organisation in order to function, and in this case, enable adaptation. Resource and social barriers (Figure 3.3[g]) are intertwined in that social barriers may underlie resource barriers, and the availability of resources may assist in overcoming certain social barriers. Social barriers are being

acknowledged with greater emphasis due to their role in hindering the conversion of adaptive capacity to adaptation action (O'Brien et al., 2006 as cited in Adger et al., 2007), affecting both the initiation and permanency of adaptation interventions (Adger, 1999, 2000 as cited in Grothmann & Patt, 2005). Physical barriers (Figure 3.3[h]) relate to how either built and/or ecological infrastructure may hinder adaptation to CC, e.g. by inhibiting the movement of species (see Section 3.2.9).

Although difficult to visually represent in Figure 3.3, the temporal scale is a vital component in understanding barriers and enablers, it brings to the fore the issue of inter-generational equity (see Section 2.3.2.4), and the fact that actors operating at different spatial scales often focus on different temporal intervals. Communities may be planning on a day to day basis and international negotiators may be considering how to deal with impacts projected to occur towards the end of the century. On the other hand, the spatial scale highlights the issue of intra-generational equity, which relates to the unequal access that communities have to the earth's natural resources and the inequity in the distribution of CC impacts across space (Section 1.4.3).

Barriers and enablers exist within a certain timeframe, being influenced not only by present circumstances, but issues vested in the past and the future. Decisions taken today will affect future generations: adaptation today, may be mal-adaptation for future generations (Adger et al., 2009). A particularly pertinent issue in SA, in relation to the past influencing the present (legacy decisions according to Moser and Ekstrom [2010], Section 3.3.1), is how the legacy of Apartheid still affects the spatial layout of SA's towns and cities (the poor living far from economic opportunities), as well as the socio-economic landscape of the country (the wealth of the country is still to a large extent race-aligned). Both of these issues are inter-linked. Landman (2010) describes how Apartheid planning placed African populations in the urban periphery; away from facilities, good services and job opportunities. Despite aims of the post-Apartheid government to 'right these wrongs', further sprawl has occurred due to: (a) wealthy people being attracted to aesthetic estates outside of the city; (b) low-cost housing schemes being developed on the urban edge; and (c) illegal squatting on the urban periphery by those that have not yet received their low-cost homes (Landman, 2010). All of which, negatively influences the poor as: (a) transport to urban areas in search of economic opportunities is expensive; (b) they do not have access to a substantial enough market for small businesses where they do reside; and (c) they experience low-levels of services (Landman, 2010). Seekings (2007) discussed how Apartheid entrenched and exacerbated income poverty and inequality; hence the post-Apartheid government faces significant challenges in dealing with this.

3.5. CONCLUSION

Chapter 3 describes the framework developed for this study, which informed this study's empirical analysis. Reflective of the iterative, messy and actor-centric process of CCA (Moser & Ekstrom, 2010), there can be multiple framings of barriers to CCA (as reflected in section 3.3). My framework (section 3.4) was informed by the literature available at the time of this study, which reflected greater research into and understanding of barriers as opposed to enablers of CCA. The framework revealed here is by no means a finished product, and was thus adjusted based on empirical findings (Chapters 6 - 9). As our understanding of municipal enabled CCA and CBA progresses it is hoped that such a framework will be continuously revised, but herein lies my first step in building this understanding.

CHAPTER 4: SYSTEMATIC LITERATURE REVIEW OF BARRIERS TO PLANNED COMMUNITY BASED ADAPTATION IN DEVELOPING COUNTRIES

4.1. INTRODUCTION AND OVERVIEW OF CHAPTER

The systematic literature review that is reported on in this chapter was informed by the understanding of barriers to CCA and CBA, as reflected in Chapters 1 - 3. This review aims to investigate barriers to planned CBA action in developing countries. Addressing questions related to the degree of CBA implementation; when it is implemented, the kind of CBA enacted, and how and why it was implemented. Who enabled the CBA, as well as the barriers experienced during the process of implementation, are also addressed. This review was published in the journal *Climate and Development*[14], and is presented here in a slightly revised format, with certain additions (e.g. Section 4.2.4) due to the stringent space constraints of a paper being lifted. The introduction section of the paper has been removed, due to the fact that it has been captured, in far more detail, in Chapters 1 - 3.

4.2. METHODS

Systematic literature reviews are increasingly being used in the CC field, to keep track of this burgeoning subject area (Antwi-Agyei, Dougill, & Stringer, 2014; Biesbroek et al., 2013; Berrang-Ford et al., 2011). Here, a systematic literature review is used to investigate a relatively new area of enquiry; barriers to the implementation of planned CBA in developing countries. The process followed for this systematic literature review was inspired by that adopted by Berrang-Ford et al. (2011). It involved systematically selecting and analysing documents found in a specific peer-reviewed literature database, based on clearly articulated questions and methods (Petticrew & Roberts, 2006 as cited in Berrang-Ford et al., 2011). The steps followed have been divided into document selection, title and abstract review and document analysis.

4.2.1. Document selection

Document selection involved a keyword search in the database ISI Web of Science™. The ISI Web of Science™ was chosen due to its extensive and current coverage of interdisciplinary academic literature. The following terms were searched for "climat*" AND "chang*" AND "adapt*" AND "community". This search ensured that documents were found that dealt with human- or naturally-induced changes (stemmed words of chang*) to the climatic system (stemmed words of climat*), that

[14] See: Spires, M., Shackleton, S., & Cundill, G. (2014). Barriers to implementing planned community-based adaptation in developing countries: a systematic literature review. *Climate and Development*, *6*(3), 277-287. doi:10.1080/17565529.2014.886995 and http://www.tandfonline.com/eprint/5We9cecRRWS45pPex2jY/full

considered adaptation or adapting (stemmed words of adapt*) and dealt with community-based adaptation or adaptation at the community level. The timeframe that was used for the search was 1 January 2009 to 7 June 2012. This timeframe was chosen due to the fact that CBA is a relatively new field of enquiry; an identical search for the timeframe 2005 - 2012 revealed that the time period of 2009-2012 accounted for most (76%) of the results. All conference proceeding papers, editorial material and news items were excluded, leaving articles and reviews to be considered. The documents which resulted from this search were then exported to RefWorks© for title and abstract review.

4.2.2. Title and abstract review

The title and abstract review step aimed to exclude documents that did not deal with planned CBA being implemented in developing countries. This step involved reading the title and abstract of all papers that resulted from the document search and setting aside those that were not applicable to this study based on a set of exclusion criteria. These criteria are described in Table 4.1. At this point, the methods adopted differed from Berrang-Ford et al.'s (2011), as exclusion criteria were tiered. They based their exclusion on the most significant criterion, but due to the narrower focus of this study and hence the greater number of criteria, many documents could have been excluded based on more than one criterion. Attempting to determine the most significant exclusion criterion would have increased the subjectivity of this study. The tiered exclusion criteria ensured that only papers that discussed planned human system CBA being implemented in developing countries were assessed for barriers. Where papers could not be excluded or included based on reading the title and abstract, their full text was analysed. Documentation of this step occurred in excel, with each document being identified by its RefWorks© identity number.

Table 4.1. Exclusion criteria for title and abstract review

TIER 1: The focus of the document is not on human system adaptation, but on natural system adaptation, which includes biotic and abiotic (e.g. water resources and/or geological systems) adaptation.
TIER 2: The focus of the document is not on CCA, or CCA in relation to one or more of the disciplines listed below: • sustainable development, • disaster risk reduction or assessment, • mitigation, • health or disease, • adaptation to environmental changes (e.g. coastal uplift processes), or • conservation and management of systems.
TIER 3: The document does not report on any form of CCA action, implementation of interventions or empirical work, but only considers: • theoretical concepts or frameworks; • the development of plans, strategies, tools, policies and/or methodologies; • assessments (including vulnerability assessments or perceptions studies), and/ or • models and statistical analyses.

TIER 4: The document does not discuss work conducted in present times; exclusion here would be due to description of work conducted a long time ago, as work planned for the future would be excluded at tier 3.
TIER 5: The document only reports on adaptation interventions that were not planned, but undertaken autonomously (as per the definition in Section 2.4.6) by local communities.
TIER 6: The focus of the work is not at the community or local level but rather at the regional/provincial, national or international level.
TIER 7: The work discussed did not take place in a developing country (as defined by the International Statistical Institute, 2012).

4.2.3. Document analysis

This step aimed to investigate the barriers discussed in the papers and potential influences on those barriers. Full-text qualitative analysis of the papers using a set of questions was conducted. Qualitative, as opposed to quantitative trends (developed by Berrang-Ford et al., 2011) (see Section 4.2.4 for more discussion on this), were ascertained by asking these questions when analysing the papers: (a) What kind of CBA was implemented? (b) How were the interventions implemented? (c) Why were the interventions implemented? (d) Who enabled the interventions? (e) What barriers were discussed?

Barriers were derived inductively from the text and then grouped according to themes, which were aligned with the framework presented in Section 3.4. Within social barriers, four themes emerged. The first related to the organisations involved in the CBA interventions and the lack of coordination between departments, stakeholders and/or policies and plans, which related to organisational barriers. The second related to discourses and worldviews that did not align well with CBA, which related to discursive barriers. The third and fourth themes related to the communities involved in the CBA, which related to normative and cognitive barriers. Normative barriers pertained to how cultural/traditional norms hinder CBA action and cognitive barriers pertained to community perceptions and attitudes that do not align well with CBA interventions. Resource barriers were grouped into knowledge and communication, financial, human resource and technology barriers. Knowledge and communication barriers included a lack of meaningful CC information, poor communication and interpretation of that information, and language issues. Physical barriers included natural (ecological) and physical (human-made) infrastructural barriers to adaptation.

4.2.4. Methodological reflections

It is worth reflecting on the process followed when I conducted the systematic literature review over an 18 month period, as many lessons were learnt along the way. The first point to note is that like traditional literature reviews (which do not follow the set steps of a systematic literature review), systematic literature reviews incur subjectivities. These relate to: (a) the fact that grey literature and book material is excluded from the review (these forms of literature may have presented useful

insights but are difficult to review using the systematic literature review approach); (b) what database is used for the word search and what words are searched for; (c) what criteria are used to exclude papers (and in my review, the order of the criteria), as well as how the exclusions are operationalised; and (d) how papers are analysed in the document analysis step.

In reference to (c), one of the challenges I faced in the document review step, before I adopted the tiered approach, was in determining which criterion should be used to exclude a paper, when it could have been excluded based on a number of criteria. Berrang-Ford et al.'s (2011) work, which inspired this review, dealt with this by determining what the main exclusion criteria was for each paper: *"Many documents can be classified within multiple exclusion categories. Documents were allocated based on assessment of primary reason for exclusion, but these groupings should not be considered mutually exclusive or decisive"* (Berrang-Ford et al., 2011, p. 3). Due to the fact that I conducted the review on my own, doing what Berrang-Ford et al. (2011) suggest would have increased the subjectivity of my work. There are subjectivities in how I placed the tiers hierarchically, but at least this is disclosed. This being said, Berrang-Ford et al. (2011) did conduct a different review to mine, and had different exclusion criteria, which may have made it easier for them to determine the main criterion of exclusion.

The second point, as a reflection of my own journey, is that I found the quantitative and deductive methods utilised in many systematic literature reviews to not be particularly useful for my review (also discussed in Sections 5.6 and 5.8 in relation to my empirical research). I came to this realisation post conducting an arduous process of deductive quantification, and attempting to use tools such as graphs and statistics to bolster the objectivity of my review and present my results in a 'scientifically-appealing' way. The 'behind-the-scenes' grappling that occurred in this process is not expressed in the paper that was published, owing to both the word-count constraints as well as the need to investigate these issues further (via me conducting more reviews and engaging meaningfully with those who have extensive experience in doing so).

The deductive and quantitative route I initially embarked upon in the document analysis step involved the use of a large Excel spreadsheet/frequency distribution table, where I had 21 categories (with multiple sub-categories) that were assessed for each of the included papers. These categories included things like what the primary stimulus for the CBA work was and what motivated the CBA etc.[15] I began

[15] The categories included: paper title; first author; continent where author resides; first author affiliation (e.g. NGO); primary stimulus for the CBA; what motivated the CBA work; whether the interventions were reactionary, anticipatory or concurrent; the importance of CC in motivating the action; the planning and implementing institution (e.g. government), how the community(ies) were chosen; rural/urban focus; region where the CBA occurred; aims and objectives of the CBA; funders; timeframe of project implementation; form of CBA (e.g.

with simply placing a mark within the sub-category(ies) applicable to the paper, e.g. I marked that the CBA was reactive. The hope was that trends would present themselves in relation to the categories (e.g. I may have found that certain forms of CBA were associated with certain types of barriers), which I could investigate using graphs and stats.

A number of challenges presented themselves: (a) I found that many of the papers reported on more than one CBA project/intervention, often in more than one location (often in different countries) and with numerous stakeholders involved. This made classifying one paper according to my criteria difficult and led to multiple criteria being selected, and difficulty in picking up trends. (b) I found it hard to classify the interventions according to the deductive criteria. For example, whether a CBA project was reactive or anticipatory; they often had aspects of both. I therefore added the term concurrent, which was then applicable to most of the papers. I also found it difficult to classify the type of adaptation, whether based on Smit, Burton, Klein, and Street's (1999, used in the IPCC's Fourth Assessment Report) 'form of adaptation' (e.g. structural, legal) or 'function of adaptation' (e.g. retreat, accommodate). Hence, I had to inductively change the sub-categories to suit the papers (e.g. awareness raising). These issues too, led to difficulties in determining trends. In summary what I found is that the CBA being described included multiple interventions, implemented by multiple stakeholders, for multiple reasons, in multiple ways and in multiple places.

Eventually I began adding copious amounts of text to the Excel spreadsheet to adequately represent the complexity that I found when analysing the papers. The spreadsheet gradually moved further and further away from allowing quantification (despite numerous attempts to produce graphs and run simple stats tests on the data), and further away from deductive categories, as each paper described unique, context-specific CBA interventions. After much struggle I eventually settled on a re-analysis of the papers, qualitatively and inductively (as described in Section 4.2.3), although guided by the knowledge I had of the CCA, CBA and barrier literature, as well as the quantitative/deductive journey I had been on. This is not to say that the spreadsheet did not prove useful, and aspects of it have been incorporated into my results sections, but only aspects that would not misrepresent the complexity found.

relocation); whether evaluation of the CBA had occurred; whether barriers were discussed; terms used for barriers (e.g. challenges); all the barriers I was looking for were listed (e.g. financial barriers); how the barriers were dealt with (e.g. solutions implemented); additional notes.

4.3. RESULTS

4.3.1. Document search and title and abstract review

The document search resulted in 480 documents moving on to the title and abstract review step. Figure 4.1 summarizes the number of papers excluded per criteria. Of the total 480 documents, only 4% moved on to the document analysis step (included). A high percentage of documents were excluded at tier 1 (42%) as they dealt with adaptation of a natural system. This is likely due to the fact that the term 'adaptation' is commonly used in the biological sciences to describe how biotic and abiotic systems deal with environmental change.

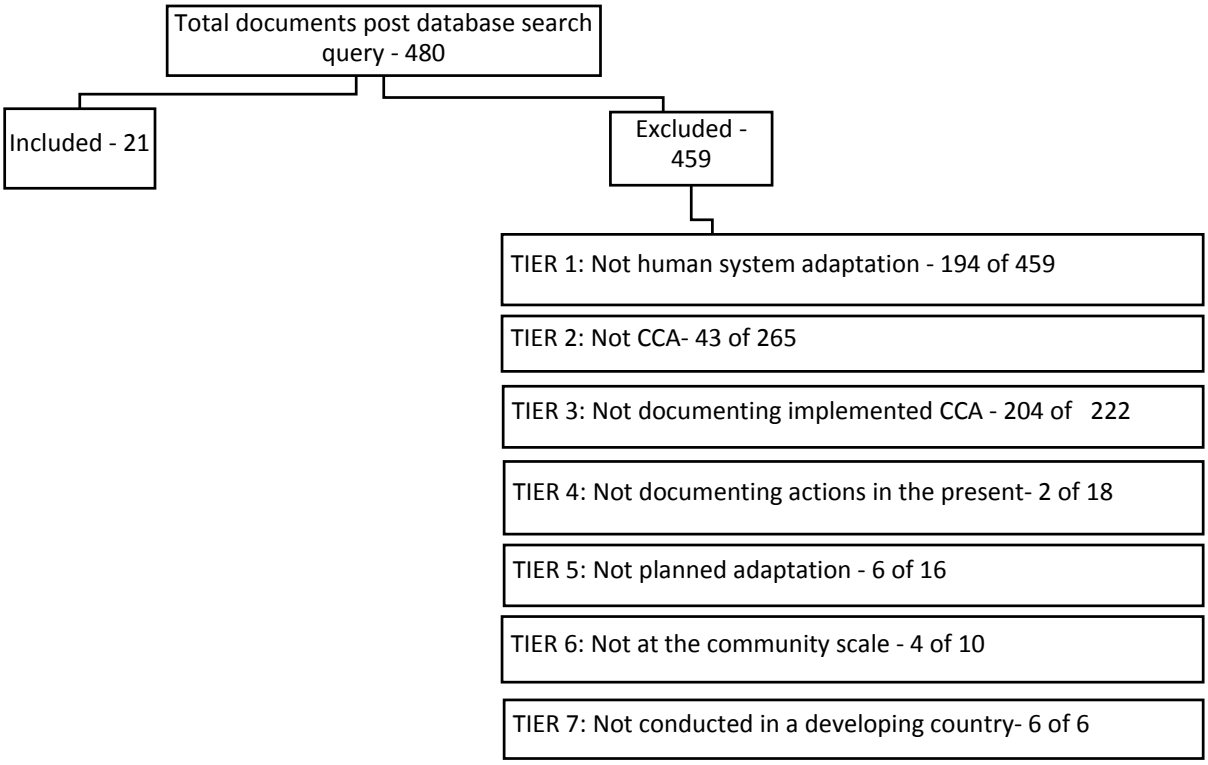

Figure 4.1. Summary diagram of the search and review steps

The criterion which excluded the most documents was tier three: no discussion of implemented interventions, which excluded 92% of the papers remaining after tier two. This high exclusion rate indicates that most of the adaptation interventions being reported on had not moved on to the managing phase of the adaptation process described by Moser and Ekstrom (2010) (see Section 3.3.1). Further analysis of the documents excluded at tier three revealed that the documents dealt with one of four issues: (a) theory (conceptual frameworks, literature or methodological reviews and/or the discussion of concepts, theories and approaches); (b) assessments (vulnerability, perception, attitude, preference, impact and/or risk assessments); (c) modelling (discussion on models and their projections

as well as statistical analyses relating to CC or long-term weather); or (d) policies and planning (policy procedures and proposed policy solutions for the inclusion of CCA in decision making), with no interventions implemented.

4.3.2. Document analysis: Analysing implemented CBA

4.3.2.1. What kind of CBA is being implemented in developing countries?

Only 21 papers moved on to the document analysis step and hence discussed the implementation of planned CBA in developing countries. Most of the papers discussed adaptation implemented in Asia (14), followed by Africa (6), small island developing nations (4) and South America (1).

Most of the 21 papers discussed a case study or case studies where numerous interventions were implemented in combination, such as: soft infrastructural interventions, e.g. raising homes, installation of rainwater harvesting tanks, widening and deepening river channels; educational/awareness interventions, e.g. dissemination of early warning systems, CC awareness raising, training on new farming techniques; planning and policy interventions, e.g. sea level rise set-back lines, biodiversity planning and developing risk management strategies.

As expected given this review's focus on CBA, all but one of the interventions discussed would be regarded as following the 'soft path' of adaptation, defined as actions that *"prioritize natural capital, community control, simplicity and appropriateness"* as opposed to the 'hard path' which promotes *"capital intensive, large, complex technology and infrastructure"* (Sovacool, 2011, p. 1177). In the extremely vulnerable Maldives though, more drastic measures have been undertaken, as part of the national government driven 'Safer Island Programme', which includes building sea walls, desalination plants, artificial islands and finding 'safer islands', where communities can relocate before or after CC induced natural disasters (Sovacool, 2011).

4.3.2.2. How and why was the CBA implemented?

Almost all of the papers reported on education/awareness occurring alongside the implementation of infrastructural and/or policy interventions, for the enhancement of community and institutional capacity to better manage climatic change. Some papers made a case for increasing resilience (aligned with the resilience approach, see Section 2.3.2.1) holistically using a functions-based approach, by aiming to achieve institutional, community and infrastructural resilience when implementing adaptation projects (e.g. D'Agnostino & Sovacool, 2011; Meenawat & Sovacool, 2011; Sovacool, 2011; Sovacool, D'Agostino, Meenawat & Rawlani, 2012), as explained by Sovacool et al. (2012, p. 86):

> *Our study demonstrates the salience of a functions-based approach to resilience and adaptive capacity rather than an asset-based one. Community or social assets, things like higher wages*

or better technology are useless if communities do not have the skills or capacity to use them. Knowledge and assets must be coupled with capacity and improved governance. This creates a more fluid and messy picture of adaptation efforts on the ground, but also one that is more realistic.

Most of the interventions considered both present and future challenges (consideration of the temporal scale, see Section 3.4), as communities were already vulnerable and hence increasing resilience to present conditions was as important as resilience to future conditions. Most of the papers spoke about CBA as pro-poor, community-led and participatory (aligned with Section 2.4). All of the interventions aimed to reduce the vulnerability and strengthen the adaptive capacity of the communities worked with. This was done by increasing community access to and understanding of climate information, by improving the resilience of infrastructure and/or livelihoods, as well as the community's ability to deal with disasters (see Table 2.2: CBA draws on various discourses).

Key conclusions emerging from the interventions included: the need for CBA to include multiple, integrated and cross-sectoral initiatives (Rawlani & Sovacool, 2011); cultural styles of participation play an important role in CBA (Roncoli, Orlove, Kabugo, & Waiswa, 2011); anticipatory action is valuable (D'Agnostino & Sovacool, 2011); and the need to integrate disaster risk reduction and CCA interventions (Adhikari & Taylor, 2012; Gero, Meheux & Dominey-Howes, 2011).

4.3.2.3. Who enabled the CBA?

CBA in developing countries is most often implemented and funded by numerous stakeholders, from diverse sectors (international funders, government, NGOs, research institutions and/or civil society). Most of the implementation was done via partnerships between stakeholders operating at different scales, where government and NGOs implement projects with communities using international funding. The value of international money was clear, as most of the funding came from organisations such as the UNDP and developed country government aid/funding agencies and departments (e.g. USAid, DANIDA), with developing country governments making in-kind contributions.

4.3.3. Document analysis: What barriers hindered CBA implementation?

Barriers were discussed in 19 of the 21 papers. Drawing from the framework presented in Chapter 3 (see Figure 3.3) these barriers were grouped into social, resource and physical barriers. However they did not exist in isolation but interacted within the specific context of the CBA intervention(s) and were influenced by barriers at higher levels (see Section 3.4).

4.3.3.1. Social barriers

Sixteen papers discussed organisational and discursive barriers. Nine of the papers discussed issues related to lack of co-ordination between government departments and between its strategies and laws (Cambers, 2009; D'Agostino & Sovacool, 2011; Douglas, 2009; Meenawat & Sovacool, 2011; Rawlani & Sovacool, 2011; Roberts et al., 2012) and within and between stakeholder partnerships (Ahammad, 2011; Gero et al., 2011; Srinivasan, Rafisura & Subbiah, 2011). For example, Srinivasan et al. (2011) found a lack of coordinated exchange of information between the producers and users of CC information, hindering the usefulness of the information for users. In a local municipality in SA there was a lack of coordination of Green Economy initiatives (e.g. alien plant clearing, fire management and job creation/skills development) implemented by different sectors within the municipality. This led to a lack of monitoring of initiatives to assess whether the overall socio-ecological objectives were being achieved as well as the potential for wasted expenditure (Roberts et al., 2012).

Discursive barriers related to, for example, how practitioners and funders grapple with the difference between CBA and good development (see Section 2.4.2), especially when they are required to monitor adaptation projects for success and establish best practice (see Section 2.4.7). This is particularly difficult as adaptation success cannot often be measured in the present. There are also difficulties in 'up-scaling' context-specific CBA, leading to piecemeal adaptation that fails to attract investment (Ayers & Forsyth, 2009) (see Section 2.4.9). These aspects of adaptation are difficult to handle within a system that adheres to the managerial discourse (see Section 2.2.3). In an interesting piece of work that considered how culture influences participation, it was found that the clash of Western and local styles of participation or discourses led to disagreements in meetings and formed a barrier to the development of adaptation plans (Roncoli et al., 2011). The enablers discussed for overcoming these discursive challenges included using pilot projects to shift thinking and embedded institutional mind-sets (Roberts et al., 2012). Recognising the role that culture and power play in forming discourses that influence participation styles, and therefore using different styles of participation so that everyone feels comfortable, was also useful (Roncoli et al., 2011). In a South African municipality, institutional resilience to change opposed pioneering adaptation initiatives. Government's focus on the achievement of targets also reduced the time required for adequate community engagement needed for CBA (Roberts et al., 2012).

Normative and cognitive barriers were discussed in seven papers. In Brazilian and Cambodian communities, for example, culture and tradition played a role in fuelling scepticism and inflexibility to new agricultural information and technologies (D'Agostino & Sovacool, 2011; Simões et al., 2010). This

scepticism was underpinned by the significant risk to poor communities if new agricultural practices fail (D'Agostino & Sovacool, 2011). This risk is illustrated by the experience of farmers in Bangladesh, who have had to mortgage their assets and borrow money to re-sow seeds, replace or irrigate crops in order to change agricultural practices. Unsurprisingly, these communities tend to adopt risk averse strategies by continuing to do what they know and trust (D'Agostino & Sovacool, 2011).

On two Eastern Caribbean islands, the implementation of reforestation to combat coastal erosion was met with opposition as community members placed high value on having a sea-view and access to the beach (Cambers, 2009). Implementation of sea-level rise set-back lines was found to be exceptionally slow, with a lack of direct hurricane impact being hypothesized as one of the contributing factors (Cambers, 2009). This relates to experiences from SA, where community apathy in relation to CC education was apparent (Roberts, 2010). These community members had no first-hand experience of major CC impacts.

Power and marginalisation can manifest as barriers to adaptation interventions, however their impact is less clear. For example, Meenawat and Sovacool (2011) found that in Bhutan, women were introverted and did not contribute significantly to projects. Whereas, in a more in-depth analysis of participation, Roncoli et al. (2011) found that in fact women and marginalised groups were expressing themselves, but used non-confrontational discursive strategies.

4.3.3.2. Resource barriers

Resource barriers related to knowledge and its communication, finances, human resources and technology. Knowledge and communication barriers were discussed in 16 of the papers, and related to a lack of or inadequate knowledge and poor communication, with three themes emerging: the lack of locally applicable CC knowledge, the clash of formal and informal knowledge systems and barriers relating to language.

Ten papers discussed challenges relating to a lack of meaningful CC information at the local scale, which exacerbated the poor levels of CC awareness in the communities and local institutions where the projects were implemented (D'Agostino & Sovacool, 2011; Meenawat & Sovacool, 2011). Where community members were aware of CC, access to CC information was often difficult (Ahammad, 2011; Dodman, Mitlin & Co, 2010; Dumaru, 2010). Where CC information was available (often through the CBA projects implemented) community members struggled to know how to use the information. Roncoli et al. (2011) identified a number of barriers to the use of seasonal forecasts by farmers in Africa. These relate to: (a) whether the information disseminated meets farmers' informational needs; (b) whether alternative management strategies and the resources needed to enable them, are available; and (c) whether the process of information translation from scientists to farmers, is done

effectively. Papers also reported on issues relating to scientific uncertainty as well as the irrelevancy of climate information for the local level (Ayers & Forsyth, 2009; Roberts et al., 2012; Srinivasan et al., 2011). Srinivasan et al. (2011, p. 6) state that *"because seasonal climate information is prepared for a broad geographic area and for time domains that do not match the communities decision making horizons, the information has very limited relevance to community level concerns."* In a South African municipality, high levels of uncertainty compromised the use (for biodiversity planning) of information on how species' distributions will shift due to CC (Roberts et al., 2012). Related to this was the identification of a knowledge gap with regards to ecosystem tipping points and thresholds, important in planning for biodiversity conservation under CC conditions (Roberts et al., 2012).

Five of the papers indicated that there were communication and interpretation issues when scientific information was disseminated to communities. Roncoli et al. (2011) found that the seasonal climate forecasts that were disseminated to local communities were often not in a format or language that communities could understand and the information reached the communities too late to be well utilised. In Bangladesh, community members tended to use traditional knowledge for flood prediction due to the climate information disseminated by the media being too technical (Adhikari & Taylor, 2012). Two papers discussed how the lack of communication between scientists and community members led to climate information not being tailored to the local context and producers of information disseminating what they knew as opposed to what communities needed (Ceccato, Giannini & Giupponi, 2011; Srinivasan et al., 2011). In one case community members lost interest in collecting climate data, as they did not understand the practical use of it (Simões et al., 2010).

Language issues were described by Meenawat and Sovacool (2011), who indicated that illiteracy in communities slowed down communication, training and data collection. Others spoke about the potential of community misconceptions due to translation challenges, as the word used for 'climate' in local languages is the same word used for 'weather' (Dumaru, 2010; Srinivasan et al., 2011) and in Fijian there is no word for vulnerability, the closest word means weakness (Gero et al., 2011). These language issues are significant as they influence how 'outsiders' are perceived and the success of the projects implemented (Gero et al., 2011).

Financial barriers related to the lack of finances amongst CBA implementers, most often in reference to developing country governments not having access to enough funding for CBA (eight papers). Governments deal with many competing priorities, and hence often defer CC work, which is perceived to be a longer-term issue (Adhikari & Taylor, 2012; Sovacool et al., 2012). Resulting financial limitations affect not only whether CBA work gets funded, but also how well it is done. A CBA project implemented on Druadrua Island (Fiji), which had a major awareness raising component, did not have

the budget for effective learning materials (Dumaru, 2010). This contributed to the fact that over half of the project participants indicated that they were not familiar with the concept of CC during an assessment of the project (Dumaru, 2010).

Human resource barriers (seven papers) were discussed in relation to lack of institutional capacity and skills to deal with CC, especially within government (Ahammad, 2011; D'Agostino & Sovacool, 2011; Meenawat & Sovacool, 2011; Rawlani & Sovacool, 2011; Roberts et al., 2012; Sovacool et al., 2012) as well as communities (Dumaru, 2010). Ceccato et al. (2011) highlighted a critical, but often lacking skill-set for CBA, facilitatory skills for participatory engagement. In Bhutan tough working conditions (remote locations, extreme altitudes, dangerous terrain and unpredictable weather) made recruitment of project implementers difficult (Meenawat & Sovacool, 2011). In a South African municipality, a partnership was initiated with a local university to overcome the lack of CC skills within local government (especially with regards to knowledge relating to the complex nexus of biodiversity and CCA). This partnership did not eradicate this barrier, as skills were needed to interpret and utilise the information resulting from the partnership (Roberts et al., 2012).

Technology barriers were less pervasive and where they were discussed it was in relation to the difficulty in sourcing appropriate technology in developing countries (two papers). One paper discussed the lack of computers with enough power to process climate information (Dumaru, 2010). Another indicated that it was difficult to source appropriate water pumps that work well and are simple enough to be managed in a geographically isolated location (D'Agostino & Sovacool, 2011; Dumaru, 2010).

4.3.3.3. Physical barriers

Physical barriers were discussed in four papers (Adhikari &Taylor, 2012; Ayers & Forsyth, 2009; Rawlani & Sovacool, 2011; Roberts et al., 2012). Ayers and Forsyth (2009) and Rawlani and Sovacool (2011) discussed physical barriers in Bangladesh, where they question the ability of Bangladesh's mangrove coastal forests to mitigate CC impacts, as they are prone to pests and deforestation. One of the respondents quoted in Rawlani and Sovacool (2011, p. 860) discusses these physical barriers:

> *The challenge Bangladesh now faces is to cope with changes in climate already happening every year. We are strengthening coastal embankments, yes, but the intensity of erosion and frequency of storms are also increasing, and I feel like we are often in a race against time where time is running out. We have developed saline tolerant rice variety crops but the concentration of salinity is going up. We can't keep on producing crops when land is flooded and water salty; it's practically not possible at the moment. Adaptation has its limits.*

An interesting example in relation to physical barriers came from Zimbabwe, where international funding was used to repair a dam. When cyclone Eline destroyed the dam soon after completion, the community-based organisation that had received the funding (Chigwada, 2005 as cited in Adhikari & Taylor, 2012), decided to decentralise the funds and invest in income-generating activities which would benefit the whole community, instead of rebuilding the dam (Adhikari & Taylor, 2012). One could argue that a physical limit to what was seen then as sound adaptation led to initiatives that successfully diversified livelihoods.

4.4. DISCUSSION

Similar to Berrang-Ford et al.'s (2011) finding that only 5% of the papers they reviewed discussed intentional adaptation action, this review found that only 4.4% of the papers reviewed discussed planned CBA implemented in developing countries. Berrang-Ford et al. (2011) argue that adaptation is in fact occurring, but has not been submitted to the peer-reviewed literature, with policies and mechanisms still at the early stages of development and the political discourse on the topic not yet translating to activities on-the-ground. Denton, Anderson and Ayers (2011) concur, indicating that the international peer-review process is unlikely to be a priority for those undertaking 'action research', where the focus is on helping communities and adhering to contractual obligations. This being said, the grey literature houses many examples of developing country CBA. A case in point is the Adaptation Insights Series, which documents lessons from seven projects supported by the CCA in Africa programme (IDRC, 2010) and organisations such as CARE (Denton et al., 2011). Adaptation to CC often happens via learning-by-doing in these contexts, where the policy and research worlds travel at different speeds (Cuccillato, 2011 as cited in Ripley & Sharma, 2011). Conducting a systematic literature review with a similar focus to this one, but which considers grey literature and book resources, would further deepen the discussion on both where CBA interventions are being reported and barriers to CBA action.

Actions taken to cope with changing conditions in developing countries, whether autonomous or planned, may also not be recognised as contributing to CCA, and hence not reported on as such. This highlights a pertinent issue in the adaptation field today: important work being conducted in developing countries is often not being communicated to decision-makers in formats that they can access, or that they consider authoritative. There is a need for increased empirical academic research in developing countries, and for that research to move into both the peer-reviewed literature (to influence vital work such as that done by the IPCC), as well as be made available in accessible and brief formats that distill the key messages to decision makers. Denton et al. (2011) advocate for capacity development and funding disbursement to developing country scientists as well as the need to find

systematic ways of assessing the credibility of grey literature so that it can influence policy and practice. The CCA in Africa programme in collaboration with the International Institute for Environment and Development (IIED) has begun responding to this challenge by launching a peer-review mentoring network project, which aims to empower African scientists to get their work into peer-reviewed journals (Denton et al., 2011).

In this systematic literature review, developing country CBA was found to be inherently context specific, with no two places likely to require the same CBA. This complexity is represented in how CBA is implemented. The CBA approaches discussed in all analysed papers involved numerous interventions implemented simultaneously by various stakeholders and organisations. These interventions aimed to decrease vulnerability to both present and future challenges. Hence, explicit trends that linked barriers to potential influencers, such as forms of adaptation, implementers, funders or reasons behind the work, were not apparent. But trends were found none the less, in what barriers were discussed and the themes within these barriers. Social and resource barriers were prevalent in most papers, with organisational and discursive and knowledge and communication barriers being the most pervasive. Key trends, barriers and lessons learnt, are discussed below.

4.4.1. Organisational and discursive barriers

Partnerships appear essential for adaptation to occur in developing countries, where communities and/or government do not possess the resources needed to enable adaptation without assistance. The partnership approach, although vital in these contexts, has the tendency to lead to organisational and discursive barriers as coordination is complex, and misunderstandings are rife. This is especially the case when organisations with different objectives, discourses and structures work together. It is also apparent when different language groups, with different epistemological starting points, are brought together. In this review, governmental organisations appear always to be part of these partnerships; highlighting the central role that government plays in enabling adaptation (also found by Biesbroek et al., 2013), both in ensuring that international funding is channeled correctly and that projects are effectively implemented and sustained. This being said, developing country governments are required to deal with numerous challenges with limited financial and human resources (Pini et al., 2007 as cited in Measham et al., 2011), leading to their focus being on coping and dealing with the most pressing needs. This contributes to reactive management and technical fixes instead of long-term proactive approaches for handling CC (Crabbe & Robin, 2006 as cited in Measham et al., 2011). Despite the importance of reactive management in dealing with climate variability, proactive and longer term adaptation interventions are also of vital importance (Tschakert & Dietrich, 2010). Planning ahead, allows past responses to be reflected upon, leading to the improvement of future

actions (Tschakert & Dietrich, 2010). Future climatic changes may also be beyond what has ever been experienced before, and thus necessitate longer term interventions. It is also often cheaper to invest in CCA interventions now that will reduce the cost of reactively responding to CC hazards in the future (Strachey, n.d). Governments have a vested interest in the communities they serve and hence it is not only essential that the governments of developing countries receive the knowledge, finances and technology needed to enable reactive and anticipatory adaptation, but that their institutional structure is reconsidered to better enable CCA work, which is inherently cross-disciplinary and messy.

4.4.2. Knowledge and communication barriers

Knowledge and communication barriers were prevalent across the papers, and related to a lack of locally applicable CC information, and also to communication challenges between different knowledge systems. In the case of the former, Dessai et al. (2009 as cited in Adger et al., 2009) make the case that inaccurate and imprecise knowledge of future climate should not be construed as an absolute limit to adaptation. Adger et al. (2009) indicate that robust decisions for CCA can be made without climate prediction as a central requirement; such decisions are more likely to lead to successful adaptation as they focus on adaptation strategies that will be beneficial across a number of potential climatic futures (as discussed in Section 3.2.1). Nevertheless, despite these sound arguments, developing country communities and governments are battling to know where to start without climate knowledge that is applicable to the scales at which they operate. Without more certain predictions there is the real potential that only incremental adaptation will be implemented, which in the end may not be enough (refer to Section 2.3.2.2).

As this review has highlighted, CC knowledge is not enough on its own, it has to be communicated effectively between the different stakeholders involved in CBA. Many papers discussed how the lack of communication between the producers and users of climate knowledge led to reduced use of the science. Linked to this challenge is the lack of skilled facilitators who could play a pivotal role in mediating knowledge between different groups. A great deal more focus should come to bear in the future on how climate knowledge is shared, not just in a one-way exchange from science to communities (Section 2.4.4). Existing knowledge and experience of changes within communities need to be acknowledged as starting points for opening up conversations about adaptation. This points to the need to communicate climate information about trends that people actually experience. Patt (2009) indicates that people do not generally experience incremental changes, but rather inter-annual variability, such as ENSO and changes in extreme weather events. Perhaps, communicating the effect of climate variability, particularly in the coming decades, will be of more use to communities (Hulme et al., 1999 as cited in Patt, 2009).

4.4.3. Lessons from the review

Social, resource and physical barriers are experienced when planned CBA is implemented in developing countries. These barriers interact and overlap significantly across categories of barriers and are influenced by barriers at international, national, local and community scales (nested spatial scales, see Figure 3.3). This being said, organisational, discursive, knowledge and communication barriers were found to be particularly pervasive. Consideration needs to be given to how organisations and partnerships can be better equipped to deal with the complexities of adaptation. Developing country organisations, and the communities they serve, require climate information applicable to their local context, which can be effectively utilised by those who need it most.

One of the ways we can deepen our understanding of barriers to adaptation, as an essential step in overcoming them, is by conducting reviews such as this, and expanding their scope, as well as conducting in-depth analyses of empirical case studies (see Chapters 6 - 9). Developing countries are already experiencing major changes in their environments, and are reacting and planning for CC out of necessity. How this adaptation is being implemented is context specific, but a number of lessons can be distilled. CBA requires access to resources (Adhikari & Taylor, 2012), both financial and human, and boldness and determination (Roberts et al., 2012). Simultaneously, it requires time and patience to learn with local communities and organisations about their reality and experiences, acknowledging the ways in which culture, traditions and language can either enable or inhibit planned CBA activities (Dumaru, 2010). Ultimately, adaptation will only succeed if it is acceptable to the people concerned, and congruent with their values and way of life.

4.5. CONCLUSION OF PART I

This chapter concludes Part I of my thesis, where I have drawn on theoretical, contextual and empirical contributions within the literature to inform my understanding of the potential barriers to and enablers of planned CCA and CBA in developing countries. This understanding, which included the development of a conceptual framework and completion of a systematic literature review, structured how I conducted the case study analyses (discussed in Chapter 5). There are multiple barriers to and enablers of planned CCA and CBA, which overlay and interact. These barriers - here classified as social, resource or physical barriers - which manifest at the local scale, are influenced by factors operating at provincial, national and international levels. Part I provides the foundation of my research; a foundation that is movable, due to the fact that my research is reflexive at its core (see Chapter 5). Hence, the framings developed in Chapters 1 - 4 are questioned, reconsidered and reshaped by the empirical case study research housed in Chapters 6 - 9, and then grappled with in Chapters 10 and 11.

PART II: EMPIRICAL ANALYSIS

CHAPTER 5: METHODS

5.1. INTRODUCTION

This study attempts to answer research questions that were stimulated both by my experience[16] of the challenges that municipalities face in understanding, planning and implementing CCA and CBA, as well as the growing literature, which highlights: (a) the need to develop solutions that assist the most vulnerable in adapting to CC; (b) the role that municipalities play in enabling CCA; and (c) the need to overcome barriers to adaptation (see Section 1.2). My literature-based understanding of barriers to CCA and CBA is documented in Chapters 2 - 4. This understanding is further developed through the empirical analysis of four South African case studies (Chapters 6 - 9). The broad methods adopted throughout this study, and specifically in relation to the case study analysis, are described here, with more detailed methods sections existing in Chapter 4 and Chapters 6 - 9. At its core, the methodology adopted is reflexive, being both literature-aware and open to new findings, and using both deductive and inductive reasoning. My primary goal was to implement an approach that lends significant insight into the social, institutional and governance processes of CCA at the local level so as to answer my research questions with methodological integrity, open disclosure, verification and triangulation.

5.2. OVERVIEW OF THE METHODOLOGY AND METHODS EMPLOYED

Figure 5.1 outlines the methodological steps taken during this study, with revision of the framework for analysing barriers to and enablers of CCA and CBA, occurring throughout the process. My study involved the in-depth and holistic investigation of barriers and enablers of municipal planned CCA and CBA, which is a complex and relatively new area of enquiry, and hence required the use of a case study method (Tellis, 1997). I used triangulation of empirical results to verify findings, by undertaking analysis of key documentation relating to each municipality, informal discussions and Qualitative Content Analysis (QCA) of semi-structured interviews. Post the initial analysis of these sources of information, I presented my findings via feed-back sessions to relevant stakeholders and interacted with CCA experts, to garner feed-back and comments to verify and/or modify my findings.

[16] I worked as a Specialist Climate Change Consultant and Climate Protection Scientist at EM, for three years prior to undertaking this study.

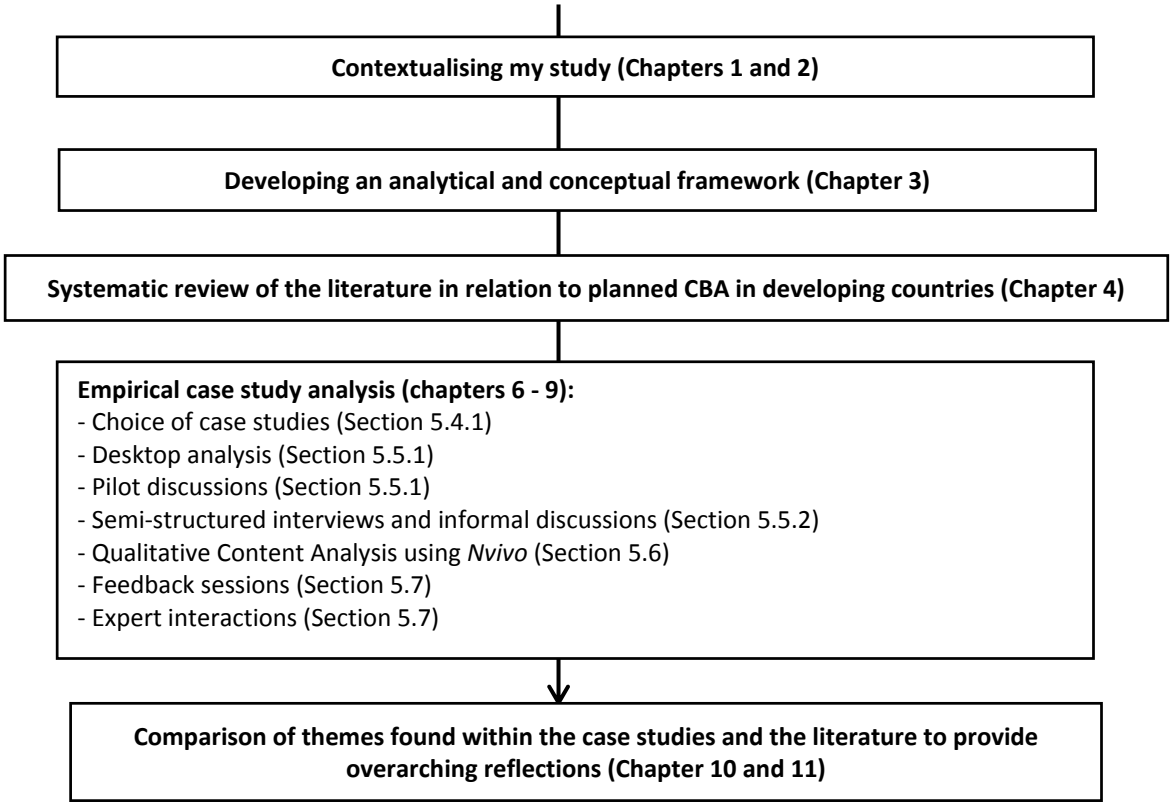

Figure 5.1. The methodological steps of this study

In adherence to the principle of reflexivity, my framework (presented in Chapter 3) was adjusted during case study analysis. Physical barriers, as defined in Section 3.2.9, were rarely discussed in the semi-structured interviews, while the influence of existing socio-economic challenges and climatic conditions in hindering CCA was. As hypothesized in Section 3.2.9, this was expected to a certain extent, due to my study's focus on socio-institutional and governance issues (Section 1.4.2). The lack of discussion of physical barriers may also have been due to the fact that the inability of natural and physical infrastructure to cope with CC had not yet been perceived. The category, physical barriers, was thus changed to contextual barriers, which encapsulates: (a) vulnerability under existing climatic conditions; and (b) vulnerability under existing socio-economic conditions.

Answering my research questions (see Section 1.3) required qualitative study, as it involved investigating the challenges that those understanding, planning and implementing CCA and CBA at the local level, face. This could only be ascertained by interacting with these individuals in an in-depth manner. The process I followed was similar to that proposed by Bernard and Ryan (2010) for research that requires qualitative study; how these steps relate to my study is documented in Table 5.1.

Table 5.1. Bernard and Ryan's (2010) steps for qualitative research in relation to my study

Step name	Step explanation	Step in relation to my study
Exploration	Looking for themes or patterns to develop an initial model of how a complex system works.	Achieved via traditional literature review (Chapter 2) and framework development (Chapter 3).
Description	Ascertaining the presence and quantity of the issues being investigated.	Achieved via systematic literature review (Chapter 4) and empirical case study analysis (Chapters 6 - 9).
Comparison	Determining how different or similar case studies are.	Achieved via comparison across the four empirical case studies and in relation to the literature (reported on in Chapter 10 and 11).
Testing models	Assessing whether the case studies conform to the proposed model.	Achieved via revision of the framework based on case studies in the literature and empirical case study findings.

During case study exploration, a transdisciplinary and reflexive process was conducted, where the co-production of knowledge occurred via interactions with municipal officials, project implementers and CCA experts. The approach was transdisciplinary as it encouraged mutual learning by both researcher and researched, operating within diverse fields. It aimed to "*overcome the mismatch between knowledge production in academia, and knowledge requests for solving societal problems*" (Hoffmann-Riem et al., 2008, p. 3); particularly because the research questions were derived from real world challenges that I experienced[17]. The method also followed a 'reflexive modernity' approach (Beck, 1992 as cited in Hubert, Meuret & Bonnemaire, 2008), which encourages mutual reflexivity, where the researcher acknowledges his/her influence on the processes and outcomes of the research (Steedman, 1991 as cited in Thorpe & Holt, 2008). According to this approach, those that *"pose the problems, those who are implicated in the problems and those who help deal with them"* (Hubert et al., 2008, p. 104) all influence the research process and outcomes. I developed strong relationships with many of the research participants, which allowed mutual sharing of knowledge to occur throughout the research process, benefitting both myself and the participants in my study. Through long-term interactions with many of the interviewees prior to and during this particular piece of research, trust was able to be developed, leading to increased access to the 'backstage' issues of local government (Goffman, 1959 as cited in Dannevig, Hovelsrud, & Husabø, 2013).

During this research I adhered to the four rules of qualitative heuristics that Kleining and Witt (2000) propose: (a) be open to new concepts and the fact that one's preconceptions may need to change, based on the data; (b) be open to the fact that the research topic may change during the research

[17] I worked as a Specialist Climate Change Consultant and Climate Protection Scientist at EM, for three years prior to undertaking this study.

process; (c) adopt different approaches to collecting one's data (aligns with the concept of triangulation); and (d) conduct analysis to try and ascertain similarities within the data. Although it must be stated that where there were differences or anomalies in findings, these were not abandoned or ignored, but investigated.

5.3. THE CASE STUDY APPROACH ADOPTED

Case study analysis is useful for investigating phenomena vested in present-day on-the-ground contexts, where these phenomena and their contexts cannot be easily separated (Yin, 1994); as well as in situations where the discovery of how things happen and why is important (Yin, 2008 as cited in Bernard & Ryan, 2010). Yin (2009) recommends that theoretical propositions (described in Chapter 2 and 3) be in place prior to data collection and analysis. Developing theory prior to data collection is a key difference between case studies and ethnography and grounded theory, which deliberately avoid theoretical propositions (Yin, 2009). This theoretical grounding creates a stronger research design and heightens the researcher's ability to interpret the data. It also guides the focus of the research, preventing researchers from becoming overwhelmed with the plethora of data assessed during case study research (Yin, 2013).

Case study research tends to draw from a small number of cases and to utilise qualitative methods, with triangulation being used to increase the credibility of the results (Gerrig, 2007). Triangulation can be achieved by analysing various sources of data in different contexts (the approach used in this study), by different investigators analysing the same data, and/or or by using different methods (Denzin, 1984 as cited in Tellis, 1997; Gray, 2004). These different methods may include inductive and deductive reasoning (see Section 5.6.2) as well as qualitative and quantitative analysis (Gray, 2004). Due to the numerous sources of data, approaches and techniques used in case study analysis, there is no standardised case study method. The methods applied need to be tailored to the research question(s) and adjusted as the research progresses, which requires flexibility and reflexivity on the researcher's part (Gray, 2004). This study has adopted a multiple case study approach, which is useful for developing rich results. The process followed is outlined in Figure 5.2

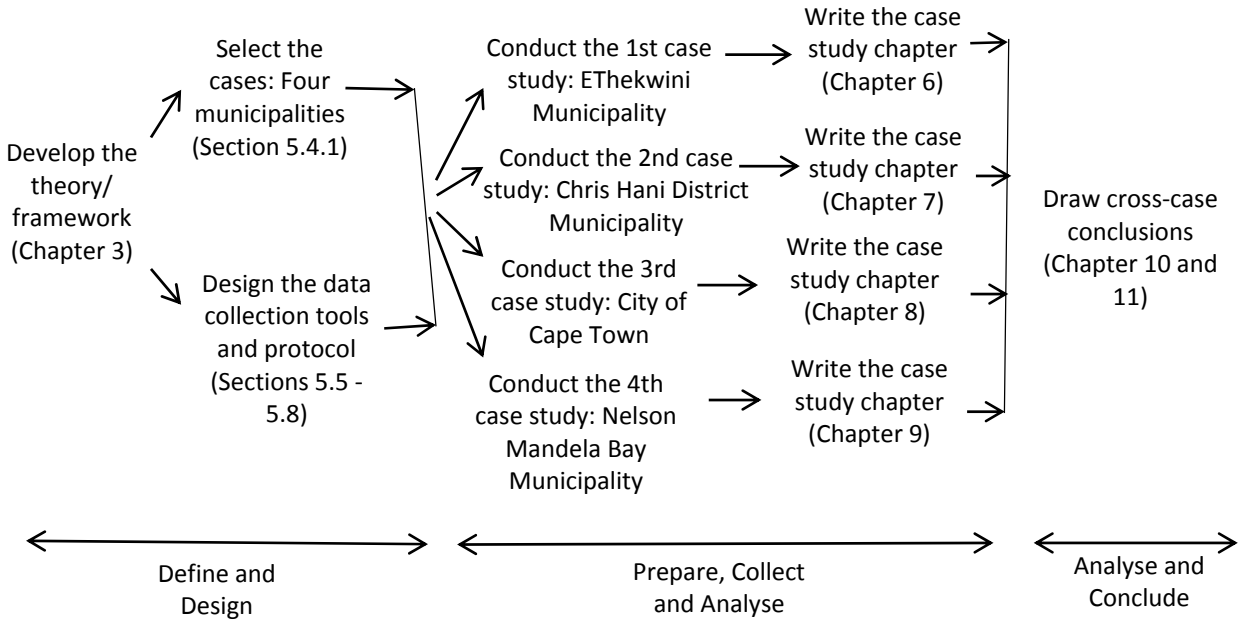

Figure 5.2. Multiple case study method utilised in this study; based on a figure featured in Gray (2004, p. 127)

5.4. CHOICE AND DESCRIPTION OF CASE STUDIES

5.4.1. Choice of the cases studies

The choice of case studies was based on criterion sampling, where cases were selected based on the prime focus of the study (Gray, 2004): barriers to and enablers of municipal planned CCA and CBA. I began by searching for municipalities in SA that were known for their CC work. The two leading municipalities in this regard are eThekwini Municipality (EM) (EM, 2011a), which is located in the province of KwaZulu-Natal and governs the City of Durban, and the City of Cape Town (CoCT) (Cartwright at al., 2012a), which is located in the Western Cape. Being based in the Eastern Cape and acknowledging that it is one of the poorest provinces in SA (Makiwane & Chimere-Dan, 2012) and therefore has some of the most vulnerable people in the country, increasing the necessity for CCA and CBA, I sought out two more cases in the Eastern Cape. I was aware that Nelson Mandela Bay Municipality (NMBM) (governs the City of Port Elizabeth) staff had been involved in a coastal cities CCA network and had presented and attended CC conferences to share their experiences. I discovered, via desktop research, that Chris Hani District Municipality (CHDM) had developed a CC and service delivery linked programme that had won the municipality several awards. These two municipalities were thus chosen due to the fact that they had conducted CC work (albeit to a smaller extent than EM and CoCT), and were likely to experience different barriers and enablers, when compared to the two

well-resourced metropolitan municipalities (see budget column in Table 5.2). The approximate locations of these four municipalities in SA is represented in Figure 5.3 below.

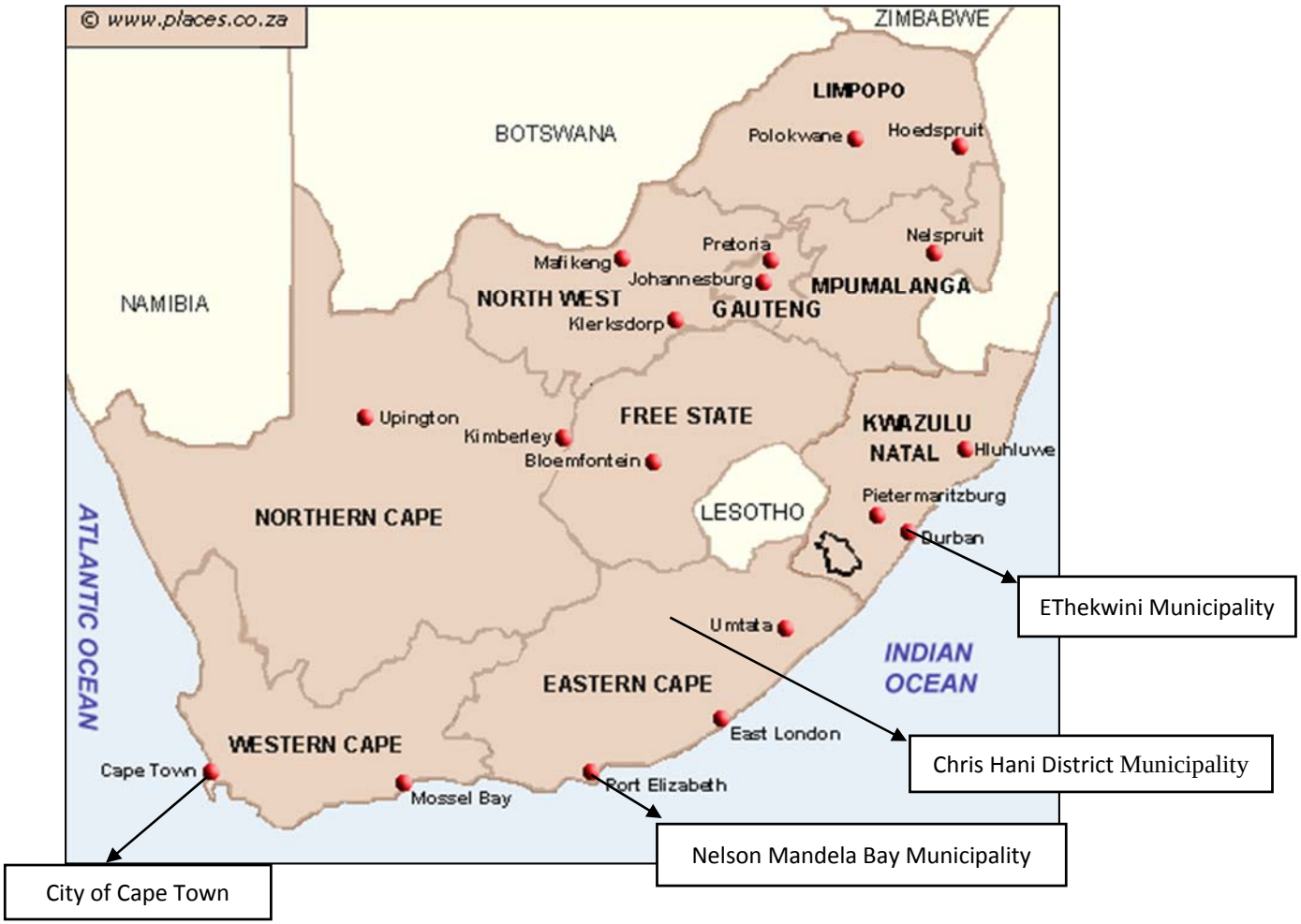

Figure 5.3. The location of the four municipalities in relation to SA and its provinces (image from SA PLACES Copyright@ 1997-2014)

5.4.2. Description of the municipalities

The EM area has a sub-tropical climate (Roberts & O'Donoghue, 2013), and 67% of the municipal area is considered rural in nature (EM, 2011b). EM's economy is dominated by tertiary industries, e.g. finance, manufacturing, and community services (EM, 2014a). The CoCT area has a Mediterranean climate (Mkefa, 2010), its economy is strongly influenced by finance and business services, manufacturing, trade and hospitality, community services and general government (CoCT, 2014a); and it has very few rural settlements.[18] The majority of CHDM's area is arid to semi-arid, receiving less than an average of 400 mm of rainfall annually, with drought conditions affecting the municipality's ability to eradicate service delivery backlogs (CHDM, 2014a). Large portions of the CHDM population are dependent on grants and remittances (CHDM, 2014b). NMBM, has a temperate climate and an economy that has a strong manufacturing base (NMBM, 2014a).[19]

Although CHDM is the only district municipality[20] within the cases chosen, CHDM and NMBM are more closely aligned in relation to population size, and NMBM has a far smaller budget than the other two large metropolitan municipalities[21]: EM and the CoCT (see Table 5.2). CHDM holds similarities with EM, as both have significant rural elements and areas under their jurisdictions that were previously 'homeland' areas (under the Apartheid administration). Thus, EM and CHDM both have the challenge of managing portions of rural land which exist under two leadership structures; the municipal system of councillors and the traditional system of chiefs and headmen. It is often assumed that if a municipality has a relatively large budget, then a lack of financial and human resources for CC action will be less of an issue (Mokwena, 2009). This inference would mean that EM and the CoCT should be leading in relation to CC actions; which will be investigated in Chapters 6 - 10. A final note in this section is that CHDM has the largest area to service and a legacy of under-development to overcome (especially in areas previously under homeland administration).

[18] 89.6% of the Western Cape population lives in urban areas (PROVIDE, 2005), this is assumed to be an even higher percentage for its largest urban centre: Cape Town.

[19] I was unable to find any indication in municipal document as to the urban/rural split within the NMBM area (see Table 9.1 for more on this).

[20] A district municipality is classified as a category-C municipality, which is responsible for capacity-building and district-wide planning for local municipalities within its jurisdiction (Government of SA, 2013).

[21] A metropolitan municipality is classified as a category-A municipality, indicating a municipality located in a metropolitan area that has single budgets, common property ratings, service-tariff systems and single employer bodies. Metropolitan municipalities also have decentralised powers and functions (Government of SA, 2013).

Table 5.2. Summary of pertinent municipal information

Name of municipality and province	**Type of municipality**	**Population size** (StatsSA, 2011)	**Annual budget** (2014/2015 financial year)	**Unemployment** (StatsSA, 2011)	**Total area** (km^2)	**Project investigated**
EThekwini Municipality, KwaZulu-Natal	Metropolitan	3 442 361	R 35.8 billion (EM, 2014b)	30.24%	2 297 (EM, 2011b)	Buffelsdraai Community Reforestation Project (BCRP)
Chris Hani District Municipality, Eastern Cape	District	795 462	R 1.3 billion (CHDM, 2014c)	39.66% (average of all 8 local municipalities)	36 558 (CHDM, 2013)	Rural Sustainability Commons Programme (RSCP)
Nelson Mandela Bay Municipality, Eastern Cape	Metropolitan	1 152 115	R 8.1 billion (NMBM, 2014b)	36.56%	1 950 (NMBM, 2013)	--
City of Cape Town, Western Cape	Metropolitan	3 740 026	R 34.8 billion (CoCT, 2014b)	23.88%	2 461 (CoCT, 2012a)	--

5.4.2.1. CC planning and governance

All four of the municipalities have CC matters featured in their core planning document: the Integrated Development Plan (discussed in each of the case study chapters). This is an essential step in ensuring the implementation of CC work, as the Integrated Development Plan details the objectives and targets for each of the municipality's departments/directorates. These objectives and targets are represented by Key Performance Areas and measurable Key Performance Indicators, which are used to monitor the performance of municipal staff as well as the performance of the broader municipality. The Integrated Development Plan is linked to the budget by the Service Delivery and Budget Implementation Plan, which details the implementation of service delivery and the budget for the financial year in compliance with the Municipal Finance Management Act, 2003 (Act 56 of 2003) (City of Tshwane, 2014).

5.4.2.2. CCA projects implemented at the community scale

Desktop research revealed that EM and CHDM had implemented projects at the community level that had CCA benefits. Investigation of these projects was used to understand the barriers and enablers across the 'understanding, planning and managing' stages of the adaptation process (Moser & Ekstrom, 2010) in relation to planning and implementing community level projects. Hence, I interviewed more people (municipal staff, project implementers and community members involved

in the projects) and spent more time in EM and CHDM, as I investigated the community level projects implemented in these municipalities.

5.5. DATA SOURCES AND COLLECTION

5.5.1. Desktop analysis and pilot discussions

Desktop analysis of municipal websites and policy/planning documents as well as any reports or papers written on the CC work of each municipality bolstered my understanding of the CC work being conducted in each case. These documents (publically available and internal), sourced off the internet and received from interviewees prior to and post our interactions, informed my overall understanding of the cases and contributed strongly to the third sections within each case study chapter: the municipality's CC evolution. The analysis of the municipal websites and the documents was useful for attaining unobtrusive data that reflects the organisations perceptions of itself and indicates the image that it wants to portray to the public (Gray, 2004). I also attended and presented at workshops and meetings[22] where CC work was discussed, both in relation to the case studies and in general, and these interactions further developed my knowledge of barriers to and enablers of CCA work in SA.

The desktop analysis assisted in the identification of the key respondents in each municipality with whom pilot discussions could be held. The primary criterion being that the individuals were those significantly involved in the planning and implementation of CCA initiatives. These initial discussions, done telephonically, face-to-face or via e-mail with the key informants in relation to CCA work in the case studies (EM 1, CHDM 1, NMBM 1 and CoCT 1, see Table 5.3) allowed me to ascertain what had been done to date, whether there were other stakeholders I should interview and whether a CCA project had been implemented at the community level. In relation to other stakeholders interviewed; these were individuals involved in the planning and implementation of CC interventions in the municipality, with a focus on CCA. I interviewed those individuals who were key to the municipalities' CC work to date (particularly those at the management level), as these individuals were likely to have a good understanding of the barriers and enablers experienced. In the case of EM and the CHDM, where I had identified community level projects with CCA benefits, being planned by the

- [22] Meetings in relation to being a project team member and reference group member of the Water Resources Commission project entitled: 'Planning for Adaptation: Applying Scientific Climate Change Projections to Local Social Realities' (K5/2152/1).
- Climate Adaptation Monitoring and Evaluation Workshop, 19 February 2013, University of Cape Town, SA.
- CHDM Environment and CC Forum, mid-2013, Queenstown, SA.
- Southern African Adaptation Colloquium, 25 - 26 November, 2013, Cape Town, SA.
- ResearcherLinks Climate Services Workshop, 3 - 6 March 2014, Cape Town, SA.
- South African Geographers' 10th Conference, 27 June 2014, East London, SA.

municipalities, stakeholders involved in the planning and implementation of these projects were also sought out.

5.5.2. Semi-structured interviews and informal discussions

Semi-structured interviews were held with officials involved in each municipality's CC work. During these semi-structured interviews a number of key themes were covered. These included: (a) understanding the interviewee's role in the municipality, and their role in the municipality's CC work; (b) exploring the interviewees understanding of CC, and how it should be tackled in the municipality; (c) discussing the barriers to and enablers of the municipality's CC work, with a specific focus on CCA and CBA/community-level interactions. No interviews were the same though. Although ensuring that the above-listed themes were covered and utilising the literature-based understanding gained (as per Chapters 1 - 4), I asked questions specific to my researched understanding of the individual's role, as well as questions stimulated by document analysis. Interviews with municipal staff lasted between one and two hours, bar the interview with CHDM 4, which lasted 20 minutes due to CHDM 4's limited involvement in the CC work to date. The codes for these individuals are presented in Table 5.3 (EM 1 - 4; CHDM 1, 3 and 4; CoCT 1 - 3; NMBM 1 - 3).

Semi-structured interviews with staff employed by the partner organisations involved in the implementation of the community level projects in EM and CHDM were also held (Table 5.3: EM 5 - 6; CHDM 2). With these individuals, the key themes covered, related to: (a) their role in their organisation as well as the municipal-enabled community project; (b) their understanding of CC; and (c) their understanding of the barriers and enablers at play in relation to the project, as well as generally in relation to CC, CCA and CBA. These interviewees lasted between 45 minutes and 1 hour 45 minutes. Community members involved in the projects (Table 5.3: EM 7 - 14; CHDM 5 - 9) were also interviewed in relation to: (a) their role in the municipal-enabled community project; (b) the concerns they had for their community; (c) their understanding of CC; and (d) their understanding of the barriers and enablers at play in relation to the project, as well as generally in relation to CC. These interviews varied significantly in length - from 10 minutes to 1 hour 15 minutes - based on the community member's willingness to share information.

Gray (2004) states that interviews are attained based on the interviewers status (internal/external, junior/senior), the interviewee's interest in the project (pay offs) and the trustworthiness and professionalism of the interviewer. I was able to gain access to exceptionally busy individuals, partly because most of the individuals knew me and I had established a good rapport with them, as well as the fact that they were passionate about CC work and were thus interested in my study. Having worked in a similar environment to the interviewees meant that I was able to gain a greater depth of

understanding and probe more deeply into the challenges they experienced, with interviewees sharing openly with me both verbally and with internal documents. Negative aspects relating to this were that the way I was perceived (based on previous interactions), may have influenced the answers given. To reduce bias related to this, I interviewed as many relevant stakeholders as I could (see Table 5.3) and triangulated my results via document review, feedback sessions and expert review. I also tried to create an open atmosphere in which individuals could share freely and steered clear of imposing my discourse or views on the interviewee.

In the community setting, I was an outsider, being of different race and educational level. It is hoped that my openness to different cultures and opinions, and recognition that community members hold as much knowledge as scientists and researchers, assisted in overcoming this challenge. However, some of the shorter interviews may have resulted due to this issue. To increase the ease with which community members spoke to me, I arrived with the NGO project implementers that they had established relationships with. I required their assistance in getting to the project sites, to the most appropriate community members, as well as garnering their trust. This being said, I often requested that they were not present for the interviews, to overcome the potential influence of their presence on the community member's responses. For example, I was concerned that community members may not critique the project in front of the NGO implementers, as they may have been afraid that this would negatively influence their future participation in the project.

Some community members were comfortable speaking in English, and this was useful as it allowed me to interact more freely with them as I could probe effectively in response to answers given. Others were not, and in these instances, I used a translator. There are pros and cons to using a translator; an advantage being that community members could share with more ease in their home language. A disadvantage being that I may not have picked up on the intricacies and details within their answers, and words and phrases may be difficult to translate exactly. I attempted to overcome these interpretation challenges by listening to and then discussing the recorded interviews with the translator, to ensure that I fully understood what had been said.

I utilised documents and in-depth, semi-structured interviews as my primary data sources. Documentation is useful as it is stable and can be reviewed repeatedly, but there may be biases related to who the intended audience was, or what the intended purpose of the document was. Interviews on the other hand, can be specifically targeted to the issues pertinent to one's study, offering insightful and original data, with good question response rates. A limitation, however, is that biases may exist in relation to interviewees adjusting their answers to align with what they think is expected, what would benefit them most and related to the interviewer's influence (Bernard & Ryan, 2010).

An advantage of using semi-structured in-depth interviews, was that I was able to vary the order of questions. This gave the interviewees some control over the interview and the freedom to speak to issues that they felt passionate about. This flexibility allowed the interview to flow more naturally, and gave interviewees the freedom to delve in more depth into certain issues, which revealed important truths, while ensuring that the core topics were still covered (Gray, 2004). Most of the interviewees were experts in the CC field, making this type of interview even more useful, as experts tend to respond better when they have some control over the interview (Gillham, 2000). No two interviews were the same, and were informed not just by the themes I needed to cover and the literature-based understanding that I had coming into the interview (based on the research conducted for Chapters 1 - 4), but also by the background research I had done into the municipal and NGO work, as well as the interviewee, informed by the desktop analysis discussed in Section 5.5.1.

Making the interviewee as comfortable as possible, taking context into account and improvising were essential in uncovering barriers and enablers, and garnering as much information as possible. Context related to for example, the role of the individual being interviewed, how far along the CCA work of the municipality was, the municipality's CC focus (and discourse) and whether CC projects had been implemented. Probing techniques were used to garner information and encourage interviewees to share more deeply, without being prompted to say a particular thing (Bernard & Ryan, 2010). The probing techniques I used, included: (a) allowing time for the interviewee to rationalise and express their full opinion; (b) repeating important parts of their answers to allow elaboration and clarification; (c) using affirmative comments; (d) asking for more detail when required; and (e) expanding the length of my questions to allow the interviewee time to think of their response (Bernard & Ryan, 2010). Of particular importance to my study was what Bernard and Ryan (2010) call 'baiting', where the interviewer pretends to know what the interviewee is talking about to increase their comfort in sharing. In my case, I had often experienced what the interviewee was discussing, and hence could delve more deeply into problems or solutions they raised. This resulted in interviewees sharing more openly as it did not seem like they were revealing something completely new to me.

Table 5.3. Semi-structured interviewee codes

EThekwini Municipality		**Chris Hani District Municipality**		**City of Cape Town**		**Nelson Mandela Bay Municipality**	
Interviewee code	**Position**	**Interviewee code**	**Position**	**Interviewee code**	**Position**	**Interviewee code**	**Position and length of interviews**
EM 1 - 4	EM employees at the management level.	CHDM 1	CHDM employee at the management level.	CoCT 1 - 2	CoCT employees at the management level.	NMBM 1	Involved in NMBM's CC work via direct employment and consulting to the municipality.
EM 5	Senior management: Wildlands Conservation Trust.	CHDM 2	Wildlife and Environment Society of SA (WESSA) representative involved in the Rural Sustainability Commons Programme (RSCP).			NMBM 2 - 3	NMBM employees at the management level.
EM 6	Wildlands Conservation Trust employee involved in the on-the-ground management of the Buffelsdraai Community Reforestation Programme (BCRP).	CHDM 3 - 4	CHDM staff members.				
EM 7	Group interview held with community members who are employed to implement the BCRP.	CHDM 5 - 9	Teachers involved in the RSCP.				
EM 8 - 10	Community project leaders.						
EM 11 - 14	Community members involved in the BCRP.						

The chosen form of interactions was on the most part in-depth, one-on-one semi-structured interviews with stakeholders that were sourced purposefully. This was the preferred form of interaction as, particularly in the municipal context, strong personalities or those at higher levels of management often overpower others in group contexts (Warrick, 2009). On three occasions group interviews were requested (which were granted to make interviewees feel as comfortable as possible); once in the municipality context (see Section 9.2), and twice in the community context (see Section 7.2). These group interviews added a level of complexity to the analysis, as individuals influence each other's responses and feed off each other (Bernard & Ryan, 2010). To deal with this complexity, detailed notes were taken during and post the interviews to document the group dynamics, which included whether certain individuals dominated the conversation or seemed to have influence over others.

To gain as in-depth an understanding of how things worked in each case as possible, I engaged in informal interactions with interviewees and read extensively into how the municipalities were run, both of which allowed the discussions to be more fruitful in uncovering barriers. In EM and CHDM, lengthy discussions were held with interviewees while visiting the community projects. Strong relationships with EM municipal interviewees had been built prior to this research[23] and assisted in garnering information as and when needed. I interacted with CHDM 1 and NMBM 1 fairly regularly telephonically and spent two afternoons discussing CHDM's CC work with CHDM 1, and a day and a half in NMBM 1's company, much of which was spent discussing NMBM's CC work. These informal conversations assisted in overcoming the difficulties that those working for or with municipalities have in sharing problems or failures openly. Warrick (2009) used the term 'storian' to describe the informal conversations that she found to be most useful in her research, as compared to some of the more formal participatory methods. These informal conversations were particularly useful in her study, as she was dealing with complex socio-institutional matters, as I was. She found that by spending significant time with interviewees, she was able to garner their trust and thus increase their responsiveness. To promote this informal and open atmosphere, a good rapport (an understanding based on respect and trust) with the interviewees was essential.

Informal discussions were not just held with informants working for the municipalities, and the partners and communities involved in the two community level projects, but were also held with individuals that I met at the various meetings, workshops and conferences I attended to gain an in-depth understanding of CCA in SA (see Section 5.5.1). These informal discussions were not coded, as the semi-structured interviews were, but notes were taken during and post the discussions, which

[23] I worked as a Specialist Climate Change Consultant and Climate Protection Scientist at EM, for three years prior to undertaking this study.

provided further information, to bolster the findings of the document analysis and semi-structured interviews.

5.6. QUALITATIVE CONTENT ANALYSIS OF INTERVIEW DATA

5.6.1. What informed my analysis

Content analysis, which aims to elucidate understanding of the issue being studied (Downe-Wamboldt, 1992 as cited in Hsieh & Shannon, 2005) and to gain a condensed yet broad description of the issue at hand, is the oldest empirical textual analysis method of social investigation (Titscher et al., 2000 as cited in Kohlbacher, 2006). It allows the analyses of written, verbal and visual communication, is content sensitive and flexible with regards to research design, and is concerned with meanings, intentions, consequences and context (Elo & Kyngäs, 2008). It can be used for quantitative or qualitative analysis, with a recent shift away from quantification using categories and statistics to qualitative analysis (Nandy & Sarvela, 1997 as cited in Hsieh & Shannon, 2005). This shift occurred when researchers questioned the reduction of text to numbers, with the loss of textual quality and context, often leading to simplified or distorted quantification (Mayring, 2000a as cited in Kohlbacher, 2006, and see Sections 4.2.4).

Qualitative Content Analysis (QCA): a research method for the interpretation of textual data's content, using a classification process that is systematic and involves coding for the identification of themes or patterns (Hsieh & Shannon, 2005), was used to analyse the semi-structured interviews that I conducted. The method involves qualitative data reduction, avoiding *"rash quantification"* (Mayring, 2000, p. 2), to determine consistencies and meanings that are essential to the material analysed (Patton, 2002). Essential for QCA is incorporation of the context of the texts to gain an understanding of social reality, with the reliability of the findings increasing when other contexts/studies are considered (Kohlbacher, 2006).

The procedures of QCA are step-wise and hence can be repeated, but are also flexible enough to take account of the context and aims of the research (Kohlbacher, 2006), and therefore on most occasions do not occur in a linear fashion. According to Polit and Beck (2004 as cited in Elo and Kyngäs, 2008) QCA is more difficult than quantitative analysis as it is less standardised and formulaic. There are no simple guidelines for data analysis, and the results depend on the skills, insights, analytic abilities and style of the investigator. This flexibly and the fact that there is no one right way, means that researchers must judge what variations are most appropriate for their studies. Elo and Kyngäs (2008) advocate for a certain tolerance for feeling uncertain, as QCA is no easy task and enormous amounts of work are required during this challenging process. Software, such as *Nvivo*, has been able to

alleviate these challenges to a certain extent, as it has made analysis more manageable and ordered, as well as facilitated new levels of analysis (Elo and Kyngäs, 2008).

The approach that I applied, drew from what Hsieh and Shannon (2005) call directed content analysis. This form of analysis draws from existing theory, but allows for further development or description of that theory via refinement, extension and/or enrichment. Existing theory informs the research question(s), may predict themes or relationships between themes and can be used to determine an initial coding scheme (Mayring, 2000 as cited in Hsieh & Shannon, 2005). In relation to this point, the existing theory housed in Chapter 1 informed my research questions, the theory presented in Chapters 1 - 3 informed the development of the framework housed in Section 3.4, which guided my analysis. Although the framework alerted me to potential themes and allowed the development of an initial coding scheme (Table 5.4), that coding scheme was not restrictive, and any text that wasn't able to be categorised using the scheme, was given a new code (Hsieh and Shannon, 2005). Hence, I did not force text into predetermined codes, but allowed the text as well as the existing theory to direct the analysis. This approach synthesises two seemingly contradictory methodological principles; openness and theory-guided investigations (Gläser & Laudel, 1999 as cited in Kohlbacher, 2006), while ensuring that all categories are derived empirically and are conceptually grounded, reflecting the data and field of study in a reliable manner (Kyngäs & Vanhanen, 1999 as cited in Elo and Kyngäs, 2008; Zhang & Wildemuth, 2009).

5.6.2. The analysis adopted

The specific steps that I adhered to for QCA were informed by Elo and Kyngäs' (2008) and Zhang and Wildemuth's (2009) work. Elo and Kyngäs (2008) describe three phases of QCA. The first phase being preparation, during which a unit of analysis is selected, e.g. a whole interview, a sentence, a word (see Figure 5.4[1]). The unit of analysis in my study was an interview. Then one decides whether to use manifest coding (coding based only on the text) or latent coding (coding based on the researcher's interpretations of the text, noting body language, tone, pauses etc.) My coding was grounded in the text: manifest coding, but I did note things such as the tone used, when words were emphasised and the body language of the interviewee. This influenced my understanding of the manifest coding and the interview as a whole, as opposed to qualifying as latent coding. According to Elo and Kyngäs (2008), the researcher then immerses him/herself in the text, by reading it several times, to increase familiarity with the issues discussed (see Figure 5.4[2]). I transcribed the interviews in *Nvivo*, by listening to the full interview once to immerse myself in the text, then transcribing the interview, and then re-listening to the interview while reading the transcript to check for any inaccuracies. During this step, I utilised the *Nvivo* tool: annotations, which allowed me to attach notes to certain portions

of the text, when I was reminded of an important point while transcribing or listening to the interviews.

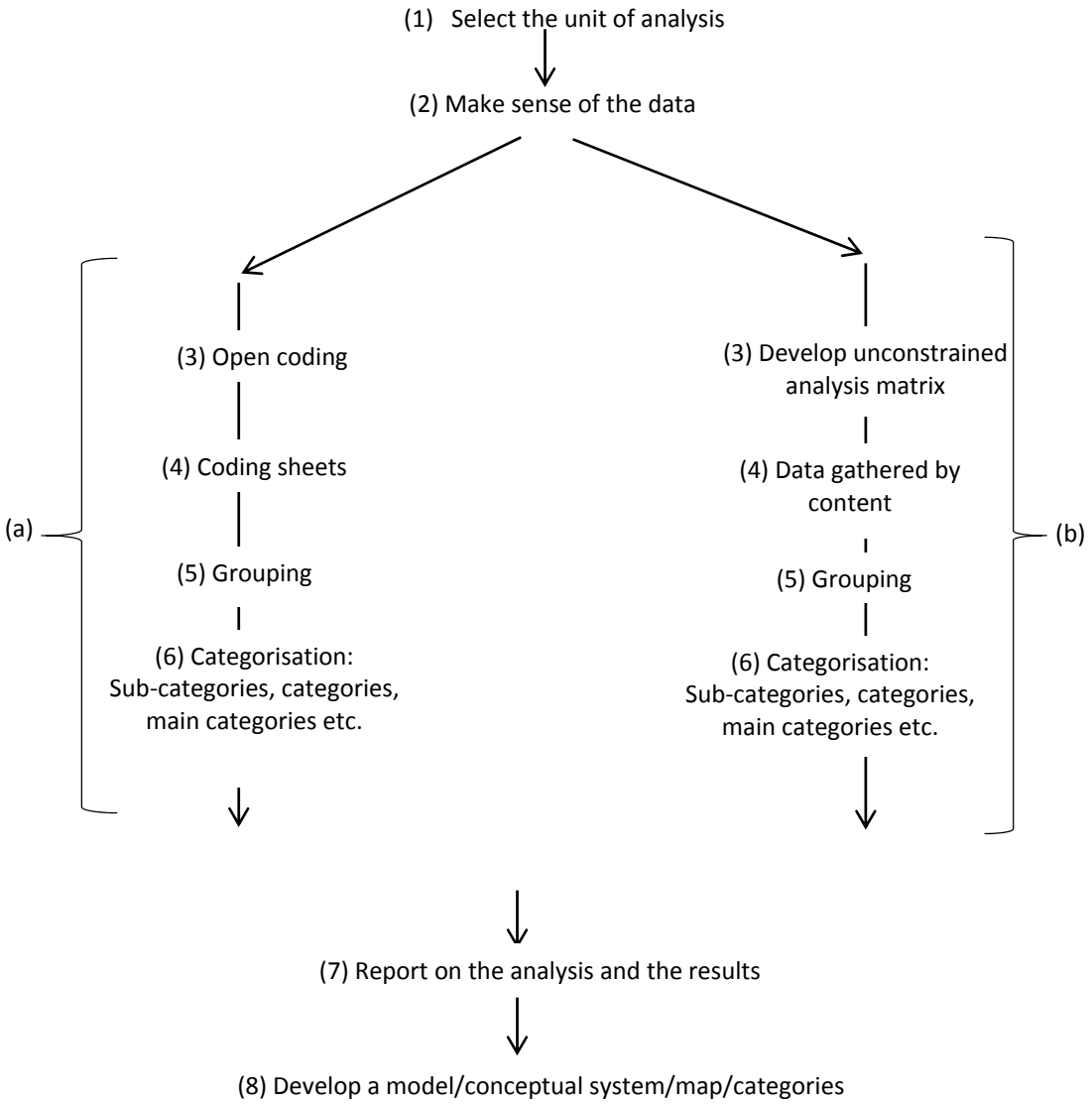

Figure 5.4. QCA steps used in this study, based on Elo and Kyngäs (2008)

The second step involves organising; during this step inductive, deductive or a combination of both approaches can be adopted. The inductive approach is useful when there are no previous studies on the field of enquiry or the information is fragmented (Elo & Kyngäs, 2008). It involves open coding, the development of coding sheets, and grouping and categorisation of themes. The deductive approach, which aligns with Hsieh and Shannon (2005)'s 'directed content analysis' discussed above, is based on previous knowledge (literature or experience) and therefore moves from general to specific (Burns & Grove, 2005). It involves the development of a structured matrix and choosing only aspects of the data that fit into this matrix (Elo & Kyngäs, 2008). The deductive approach allows for the testing of a

hypothesis and is useful when trying to test a theory in a different situation or comparing categories at different time periods (Elo & Kyngäs, 2008). This approach was not used, as it would have restricted the discovery of enablers and new barriers and/or revision of my *a priori* understanding of barriers and enablers.

I used the inductive approach (see Figure 5.4[a]) for the analysis of enablers, on the grounds that enablers of CCA is a new field of enquiry with limited understanding and literature that could be used for the development of an *a priori* analysis matrix or coding scheme. I used the combined approach for the analysis of barriers (see Figure 5.4[b]), as there was enough *a priori* knowledge to develop an unconstrained analysis matrix or coding scheme (see Table 5.4), where categories are developed before coding, but can be adjusted during the coding process. This unconstrained matrix is presented in Table 5.4, with more detailed explanation of the barriers in Sections 3.2 and 4.3.3. As I conducted the coding I continually asked of the text: is this a barrier or enabler of CCA and/or CBA? In the case of barriers, I also asked: does this align with the *a priori* coding scheme and definitions (Table 5.4)? If a barrier did not fit within the coding scheme, but still warranted coding, a new node was added or the definition of an existing node was adjusted. This approach was useful as it allowed me to evaluate the usefulness of my framework in understanding barriers and enablers, and allowed the comparison of enablers and barriers across case studies. I was able to develop deeper insight and empirically-based understanding of the various categories and themes, and add new insights if needed.

Table 5.4. *A priori* coding scheme or unconstrained analysis matrix

Barrier group	**Barrier**	**Description**
RESOURCE	Knowledge/ communication	(a) The information required for adaptation is not available. (b) Clash of knowledge systems. (c) CC science uncertainty and complexity. (d) Ineffective CC communication.
	Technology	(a) Lack of technology for adaptation (unavailable or inaccessible). (b) Unsuitable technology for the context.
	Human resource	(a) Lack of human resources with the skills required to research, plan and implement context-specific adaptation. (b) Lack of CC leadership.
	Financial	(a) Lack of funds for adaptation. (b) The way adaptation funds are dispersed does not enable contextual adaptation.
SOCIAL	Cognitive	(a) Counter-productive perceptions, e.g. don't perceive the problem when don't experience CC related impacts, CC perceived as a low priority issue (linked to a high risk society). (b) Apathy: CC is not my problem, it is too overwhelming, big and global, and difficult to understand, for me to do anything about. (c) Mistrust: people don't trust the science of CC, or whoever is communicating about CC.
	Normative	(a) Cultural, traditional, institutional or religious norms that are counterproductive to CCA. These norms shape behaviour. (b) Lack of social capital and collective action.

	Organisational	(a) The more formal rules and structures in operation within organisations that are counterproductive to CCA. E.g. (a) Organisations that are focused on the short-term and are target-driven. (b) Ineffectual placement of the CC function within the organisation's structure. (c) Organisations that are siloised. (d) Structural inertia in an organisation.
	Discursive	(a) When discourses - shared ways of apprehending the world (Dryzek, 2005) - are counterproductive for adaptation, and not questioned. E.g. the hegemonic managerial discourse is not vested in the local context, and operates in a linear, target-driven way. Managerial solutions are top-down, engineered by experts and overly technical.
PHYSICAL	Physical	(a) Natural infrastructure not able to cope with CC, which limits options for CCA. (b) Physical infrastructure not able to cope with CC, which limit options for CCA.

As discussed by Zhang and Wildemuth (2009), it was important for me to ensure coding consistency. Post coding, I went through each interview with coding stripes turned on in *Nvivo* (see Figure 5.5), to assess if all relevant text was coded, removing text that may have been incorrectly coded and adjusting coding as needed. I also went through the coding scheme as presented in *Nvivo* (see Figure 5.6) and reviewed each node/theme to ensure that what was housed within each node was correct, and that the categorisation (Figure 5.4[6]) of the nodes reflected the data accurately. I also attempted during these reviews, to ensure that the coding categories had as much internal homogeneity and external heterogeneity as possible. In *Nvivo* each node has a property tab associated with it. I monitored the adjustments made to my understanding of the coding scheme by assigning and then adjusting the properties recorded for each of the nodes.

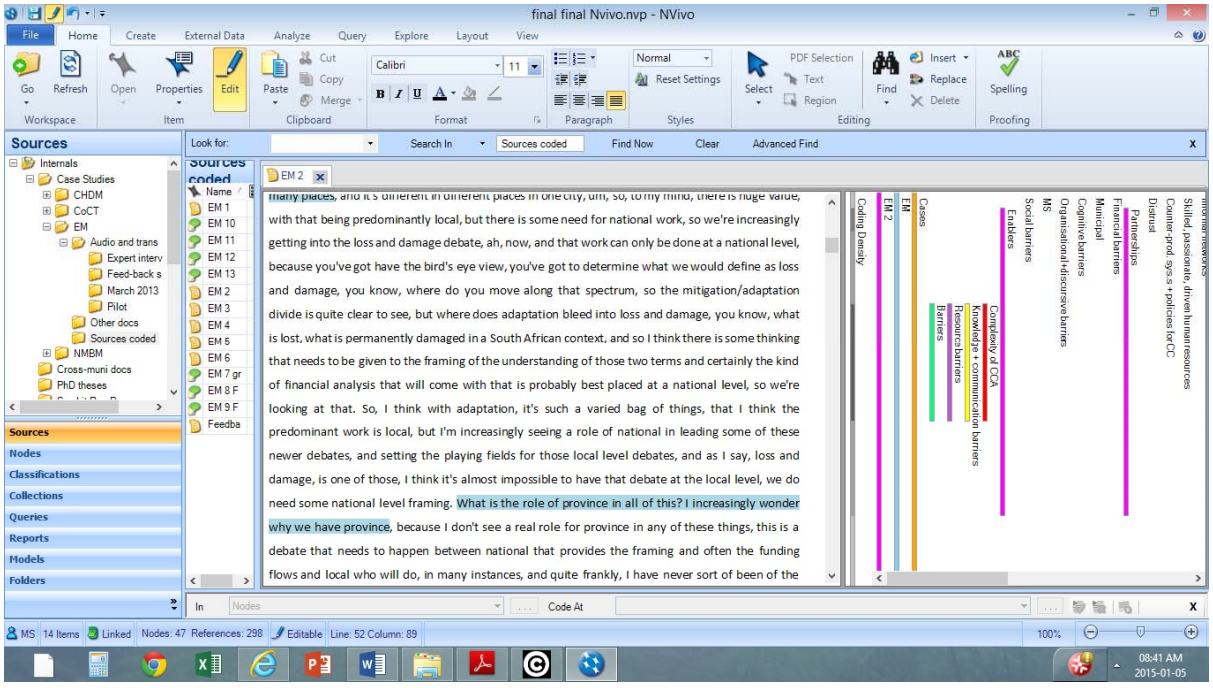

Figure 5.5. A screen shot of a portion of an interview with coding stripes turned on

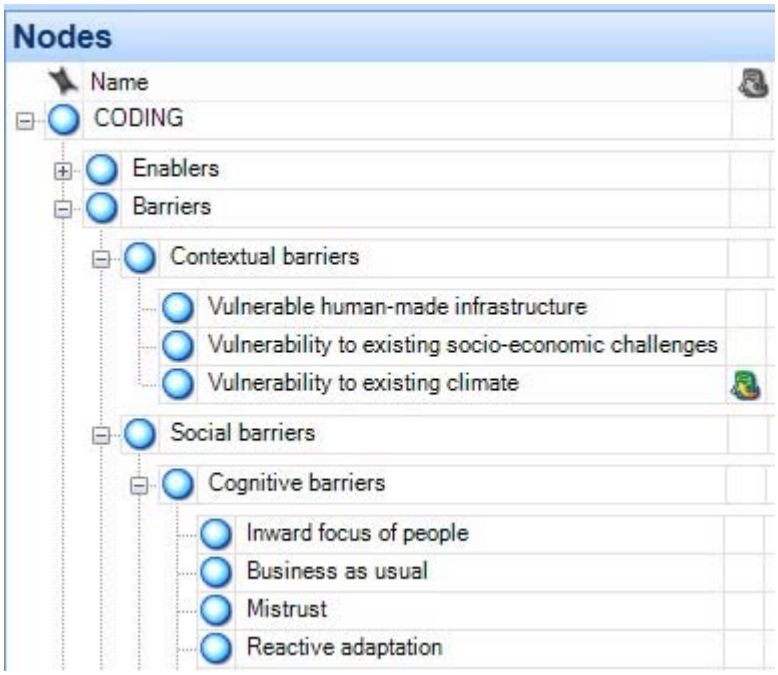

Figure 5.6. A screen shot of a portion of the coding scheme or node tree (as it is described in *Nvivo*), which represents the hierarchical structure of the nodes/themes that have been coded

The third and final phase Elo and Kyngäs (2008) describe is reporting on the findings and developing a model (see Figure 5.4 [7] and [8]). In relation to reporting on my findings, I used what Zhang and Wildemuth (2009) describe as sound reasoning to draw conclusions from the coded data. To achieve this, one uncovers patterns and ascertains whether the patterns are relevant across all or some of the data coded. I utilised the framework matrix tool in *Nvivo* to develop tables for each case study (exported to Microsoft Excel), which were useful in the analysis of the results. Multiple tables were produced for each case study, where the columns of the tables represented the interviewees and the rows: barriers or enablers. *Nvivo* produced the interview text relevant at the intersection of the interviewee at each node, e.g. EM 2 and enabler: innovative budgeting. I then summarised the interview text within each cell of the table. These tables were useful in understanding the barriers and enablers discussed in each of the cases, and in writing up my findings. A further layer of understanding was developed when I summarised the coded information within these tables. Reviewing what was stored in these tables, in combination with document review and consideration of notes taken in the field and during and post informal interactions, led to the distillation of themes presented in my case study chapters, which often represented multiple codes (*Nvivo* themes) within the ever-evolving *Nvivo* project.

Zhang and Wildemuth (2009) indicate that reporting on one's findings should be done in detail and truthfully, with a balance between description and interpretation. To justify one's findings they

suggest including typical quotations or exemplars, as well as visual representations of one's findings, e.g. matrices, charts and/or conceptual models. I recorded exemplar quotations using two *Nvivo* tools: memos and 'see also links'. Memos were either attached to an interview or a node, with the 'see also link' tool allowing specific text within an interview: the exemplar quote, to be linked to the text in the memo. These exemplar quotes were then presented as evidence for my findings in Chapters 6 - 10.

I used a number of other tools to further my understanding and interpretation of the data, in relation to how the categories or themes overlaid, differed or aligned within and between the case studies and in comparison to my literature-based understanding. They included:

- framework matrices (described above);
- queries which determined how many times a node was referred to within an interview, within a case study (across interviewees) and across case studies, as well as
- the model tool, which allowed visualisation of the results produced within *Nvivo.*

I practiced caution in interpretation of quantitative queries relating to word counts, the number of times a node was referred to and by how many interviewees, as well as percentage coverage of themes. Although indicative of discourses and/or significance of issues (Bazeley & Jackson, 2013), the emphasis with which interviewees referred to issues and other more nuanced contextual issues were taken into account when I analysed the data. Simply put, just because a certain theme was referred to most often, did not mean that it was the most important theme. Hence, I utilised the number of references to an enabler and/or barrier as a starting point for analysis, but also discussed issues that were not referred to, and noted the emphasis with which interviewees referred to certain issues.

Another essential tool to my analysis, was the use of notes that I recorded in relevant meetings, during and post the interviews or while visiting the projects, either via handwritten field notes or by voice-recording my thoughts post the interactions. These were essential, as transcripts, although useful for analysis, reduce a conversation that includes body language, tone and the way things are said (pauses etc.) into words. Notes on these influencers were captured using the memoing tool of *Nvivo*. I also used this tool while coding, to record my understanding of the case and its barriers and enablers, as it progressed and evolved. This interplay of coding and memoing is recommended by those experienced in qualitative data analysis, as a means to balance specificity and perspective when analysing text (Bazeley & Jackson, 2013).

As can be seen above, *Nvivo* was a vital tool utilised extensively in my analysis of the qualitative content of the semi-structured interviews. Conducting this analysis required that I had to learn how to use *Nvivo* and I must acknowledge the essential role that Bazeley and Jackson's (2013) book entitled 'Qualitative Data Analysis with Nvivo' played in assisting me in utilising the programme effectively to

answer my research questions. Like all software programmes, learning how to use *Nvivo* effectively took time and many trial and error sessions, but I found it to be a useful and enabling tool for QCA.

5.7. FEEDBACK SESSIONS AND EXPERT INTERACTIONS

Post QCA of each of the case studies, feed-back sessions were conducted, where the results were shared with a key informant of the municipality's CCA work. In the two cases where a community level project was analysed (EM and CHDM), a broader feedback session was held, with the key informant and stakeholders involved in the municipal CCA work and project implementation (see Table 5.5). During the feedback sessions I presented my results and then facilitated open debate with regards to the barriers and enablers identified and their categorisation. The pervasiveness and importance of these barriers and enablers was also discussed, as well as how they interact and overlay.

A final step was to discuss the findings of each case study's analysis, including key adjustments made post the feedback sessions, with an individual that had conducted work with the municipality in relation to CC (these experts included a municipal employee, a consultant, a researcher and a NGO staff member), and had the ability to offer fresh insight into the municipality's CC work to date. From here on these individuals are referred to as experts. Experts that could be used to verify my findings were relatively easy to identify in relation to the two municipalities that have conducted a lot of CC work: EM and the CoCT, but more difficult to find for CHDM and NMBM. Finally, I discussed the overall findings of my study with an expert who has conducted extensive research on barriers to adaptation; coded as E 1 (see Chapter 10 and 11).

Table 5.5. Feedback session and expert interactions

Feedback provided to:	**EM**	**CHDM**	**NMBM**	**CoCT**
Key informant for the municipality's CCA work	EM 1	CHDM 1	NMBM 1	CoCT 1
Broader group involved in the municipality's CC work	EM 1, 5 and 15 - 25 Members of the Buffelsdraai Community Reforestation Project Team	CHDM 1, and 10 - 37 Members of CHDM's Environment and CC Forum	n/a	n/a
Expert in relation to the case study	EM 26	CHDM 38	NMBM 4	CoCT 3

5.8. REFLECTING ON METHODS AND ENSURING RESEARCH QUALITY

It must be acknowledged that my own discourse and experiences in relation to CCA influenced the questions I asked and the way I conducted my research. This research was inspired by my experiences

working for local government on CCA and being driven to understand how barriers to municipal planned CCA and CBA can be overcome. This, in and of itself, indicates, although backed up by literature, that I value CCA and CBA as responses to CC and recognise the important role that local government plays in adaptation to CC (see Section 1.2).

I acknowledge that conducting neutral qualitative research in the socio-institutional domain is impossible, as people respond to and influence each other in a two-way process, and that good research in these contexts requires mutual respect, openness and reflexivity. I also recognise the critique of case study methods in relation to whether one can generalise results, due to the focus on contextual situations. Rowley (2002) questions whether generalisation, a positivist requirement, is in fact always required, and indicates that case study insights can be useful in their own right, without being generalised. This being said, increasing the number of cases considered, is a way to ensure that general or broader comments can be made based on cases (external validity). Hence, I decided to analyse four case studies and compared their results with theoretically and empirically based discussions in the literature. The QCA method has been critiqued in relation to researcher bias, where the researcher's prior knowledge may blind him or her to the discovery of new aspects in the data (Hsieh & Shannon, 2005). To overcome this bias, I practiced reflexivity, and kept records of processes followed (an audit trail) (Hsieh & Shannon, 2005), and utilised triangulation techniques.

To ensure research quality in my empirical case study based research, I consulted Yin's (2013) four tests of quality for empirical social research. Table 5.6 describes each of the four tests and how they can be achieved in case study research.

Table 5.6. Ensuring research quality in my study

Test name:	**To pass the test:**	**How to achieve this in case study analyses (Yin, 2013, p. 41):**
Construct validity	One must use the correct procedures for the concepts being studied.	• "use multiple sources of evidence • establish chain of evidence • have key informants review draft case study report"
Internal validity	In explanatory or causal studies, one must seek to establish causal relationships between conditions.	• "do pattern matching • do explanation building • address rival explanations • use logic models"
External validity	Indicate the domain to which one's findings can be applied.	• "use theory in single-case studies • use replication logic in multiple-case studies"
Reliability	Clearly demonstrate the operations that were followed during the study.	• "use case study protocol • develop case study database"

In relation to construct validity, I used multiple sources of evidence and encouraged review of my findings (see Section 5.7). The multiple sources of evidence included the traditional (peer-reviewed

and grey literature) and systematic literature (peer-reviewed literature) reviews used to produce Chapters 1 - 4. In relation to internal validity, my research straddles exploratory and explanatory study, and hence patterns were established via development and revision of my framework. In relation to external validity, I used both theory (Chapters 1 - 3) and multiple case studies (Chapters 6 - 9). The protocols and procedures that were followed to achieve reliability are explained in this chapter and in Chapter 4 in relation to the systematic literature review. More detail on the case study specific methods employed are housed in Chapters 6 - 9.

I also aimed to achieve what Zhang and Wildemuth (2009) call trustworthy research, which includes credibility, transferability, dependability and confirmability. I increased my study's credibility by building strong relationships and spending significant amounts of time with many of the case study interviewees, especially the key informants in each case. I also used triangulation, practiced negative case study analysis[24], checked my interpretations against the raw data, shared my findings with peers and checked up on information garnered from subjects. Transferability refers to whether one can infer findings from one context to another (aligns with external validity in Table 5.6). Although qualitative research does not have the core aim of generalisation (like quantitative research), I sought to provide data that is as rich as possible to allow others to decide if my findings can be applied in their situation. Dependability was enhanced by ensuring that the internal processes used in the research were coherent and that changing conditions were accounted for and dealt with appropriately (Bradley, 1993 as cited in Zhang & Wildemuth, 2009) (aligns with construct validity in Table 5.6). Lastly, confirmability occurs when peers review one's findings and can confirm the characteristics of the data used in the analysis (Bradley, 1993 as cited in Zhang & Wildemuth, 2009); achieved via the feed-back sessions and expert interactions (see Section 5.7).

[24] Searching for and discussing elements of the data that contradict explanations that are emerging from data analysis (Cohen & Crabtree, 2006).

CHAPTER 6: ETHEKWINI MUNICIPALITY

6.1. INTRODUCTION AND BACKGROUND TO THE CASE STUDY

EThekwini Municipality (EM) is considered to be a leading South African municipality in CCA work, not just nationally, but internationally (EM, 2011a). It is a typical developing country city battling with socio-economic and developmental challenges, but despite this has been an early starter with regards to municipal CC work. Significant barriers and enablers to planning and action have been experienced along the way and this chapter investigates these influences, with a specific focus on an award winning community project. This chapter begins by discussing contextual information pertinent to the case study and outlining EM's CC journey. Barriers and enablers to past, current and future CCA work garnered from document review, semi-structured interviews, the feed-back session and expert interaction, are then discussed. How these barriers and enablers play out in relation to CBA is dealt with in Section 6.9.

Contextual information specific to EM is presented in Table 6.1; this information can be compared across the four case studies by referring to Tables 6.1, 7.1, 8.1 and 9.1. EM has to deal with socio-economic and ecological challenges across urban and rural boundaries, and different leadership structures (municipal and traditional leadership). Loss of natural capital within the EM area (located in a global biodiversity hotspot[25]) is also a challenge, as communities rely on the ecosystem services it provides. CC will add to the complexity of managing these social, economic and ecological issues.

Table 6.1. Contextual information relevant to EM

Type of municipality	Metropolitan
Main city/town(s) governed	Durban, the economic hub of the KwaZulu-Natal Province (EM, 2006).
Population size	3 442 361 (StatsSA, 2011)
Size of area under municipal jurisdiction	EM Area = 2 297 km^2 (EM, 2014a) (see Figure 6.1)
Rural/urban split	67% of the city's spatial footprint is rural in nature (EM, 2011b).
Budget and economy	EM has a total consolidated budget for the 2014/2015 financial year of R 35.8 billion (EM, 2014b). The economy of the EM is dominated by tertiary industries, such as finance, manufacturing, community services, transport and construction (EM, 2014a, p. 32).
Social-economic challenges (from EM [2014b] unless indicated otherwise)	• High levels of poverty: 24.6% of EM's population is considered to be living below the national poverty line (Elsenburg, 2005 as cited in Greater Capital, 2011). • High levels of unemployment: unemployment (formal and informal sector) was stated to be as high as 74% in 2009 (EM, 2012 as cited in Roberts & O'Donoghue, 2013). • Low economic growth. • Backlogs in basic service delivery.

[25] Biodiversity hotspots are *"areas that contain high levels of endemism* (species specific to an area and not occurring naturally anywhere else) *and threats"* (EM, 2014a, p. 58). There are 34 biodiversity hot-spots in the world.

	• High levels of HIV/Aids and communicable diseases. • Social development issues such as teenage pregnancy and alcohol abuse. • Socio-economic threats to development: lack of appropriate job skills and poor infrastructure. • Previously instituted racially segregated planning (Apartheid), still hinders access to economic opportunities for the poor.
CC projections (Golder Associates [2010], Golder Associates [2011] and EM [2011a] as cited in Roberts & O'Donoghue, 2013).	• Increase in temperatures. • Increase in aggregated rainfall. • Increase in extreme rainfall events, with prolonged dry spells between rainfall events. • Observed sea level rise of 2.7 cm/decade, which may accelerate in the future.

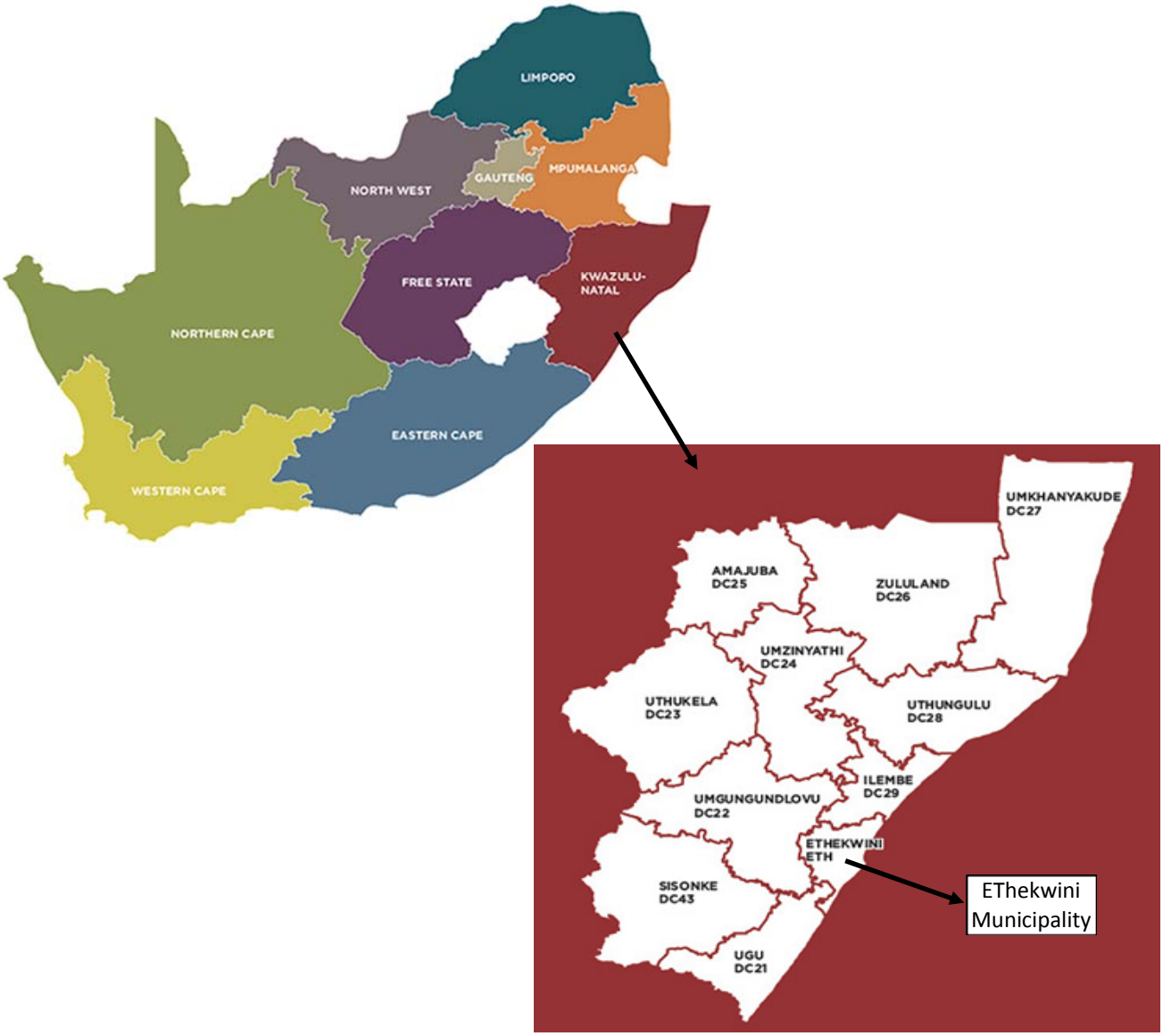

Figure 6.1. Map indicating EM's locality within SA (images from the Local Government Handbook, 2015)

6.2. SPECIFICS OF METHODS

Following the methods discussed in Chapter 5, a pilot discussion was held with EM 1 on 23 November 2012. Additional documents were attained from EM 1 and desktop analysis of these documents and those that could be sourced electronically was undertaken. From 11 to 14 of March 2013 interviews were held with stakeholders involved in the municipality's CC work, as well as the Buffelsdraai Community Reforestation Project (BCRP) (see Table 5.3). The semi-structured interviews were transcribed, coded and then analysed in *Nvivo* as documented in Section 5.6.

A feed-back session and expert discussion was held on 15 May 2014, where the results of the document review, and analysis of the semi-structured interviews and informal discussions were presented and discussed (see Table 5.5). During the feedback session, I presented a brief overview of my research and the key enablers and barriers I had found in relation to EM and the BCRP. This was followed by an open discussion where all participants shared their impressions of my results. The participants were highly responsive, which allowed for a rich discussion on the barriers and enablers to CCA and CBA, by those intimately involved in the planning and implementation of the municipality's CCA work, and the BCRP in particular. The feedback session participants' willingness to participate is likely due to the good working relationships between those present. It may also have been influenced by the fact that I presented the enablers before the barriers, creating a positive atmosphere. The recording of the session and notes taken during the session were then analysed. My results were then discussed with an expert in relation to the case study - EM 26 (see Section 5.7 and Table 5.5), who added further insights.

6.2.1. Methodological considerations

The methodological process was assisted by the working relationships that I had developed prior to this piece of research (I worked for EM for three years prior to this research), with EM and Wildlands Conservation Trust™ (referred to as Wildlands from here on) staff. These relationships assisted me in being able to gain access to extremely busy individuals, and enabled the openness with which the interviews were conducted. It also allowed me access to internal documents, which deepened my understanding of the municipality's CC work, as well as an hour and a half slot in a BCRP management meeting to run the feed-back session. It is thus hoped that the knowledge produced by this study has not only informed the research results presented in this thesis, but may also influence CCA and CBA thought-processes in EM via my interactions with EM staff during and post this research. Also to be noted, is that the first-hand experience that I gained by working within EM on the CC programmes and projects discussed in this chapter, greatly assisted in giving me experiential insight into the barriers

and enablers to EM's CC work, and more broadly into the challenges municipal officials face in planning and implementing CCA and CBA.

6.3. CONTEXTUALISING THE CASE STUDY: THE EVOLUTION OF EM'S CC POLICY AND PRACTICE

It was important for me to understand how EM's CC work evolved over time, both to contextualise the case study, as well as investigate how this process influenced and was influenced by barriers and enablers . I summarise the development of EM's CC work in Figure 6.2 and list, with brief descriptions, the various milestones in Sections 6.3.1 - 6.3.8. In Section 6.3.9 I consider EM's Integrated Development Plan, in relation to how it deals with CC. How these CC policies and practices relate to barriers to and enablers of CCA, is discussed in Sections 6.4 - 6.9. It must be noted that this section covers CC milestones related to my research focus, identified via my own experience working for EM, drawing from document review, as well as interactions with interviewees. Hence it is not an exhaustive list of all of EM's CC work; if this is what the reader requires, a good place to start is by referring to EM (2011a).

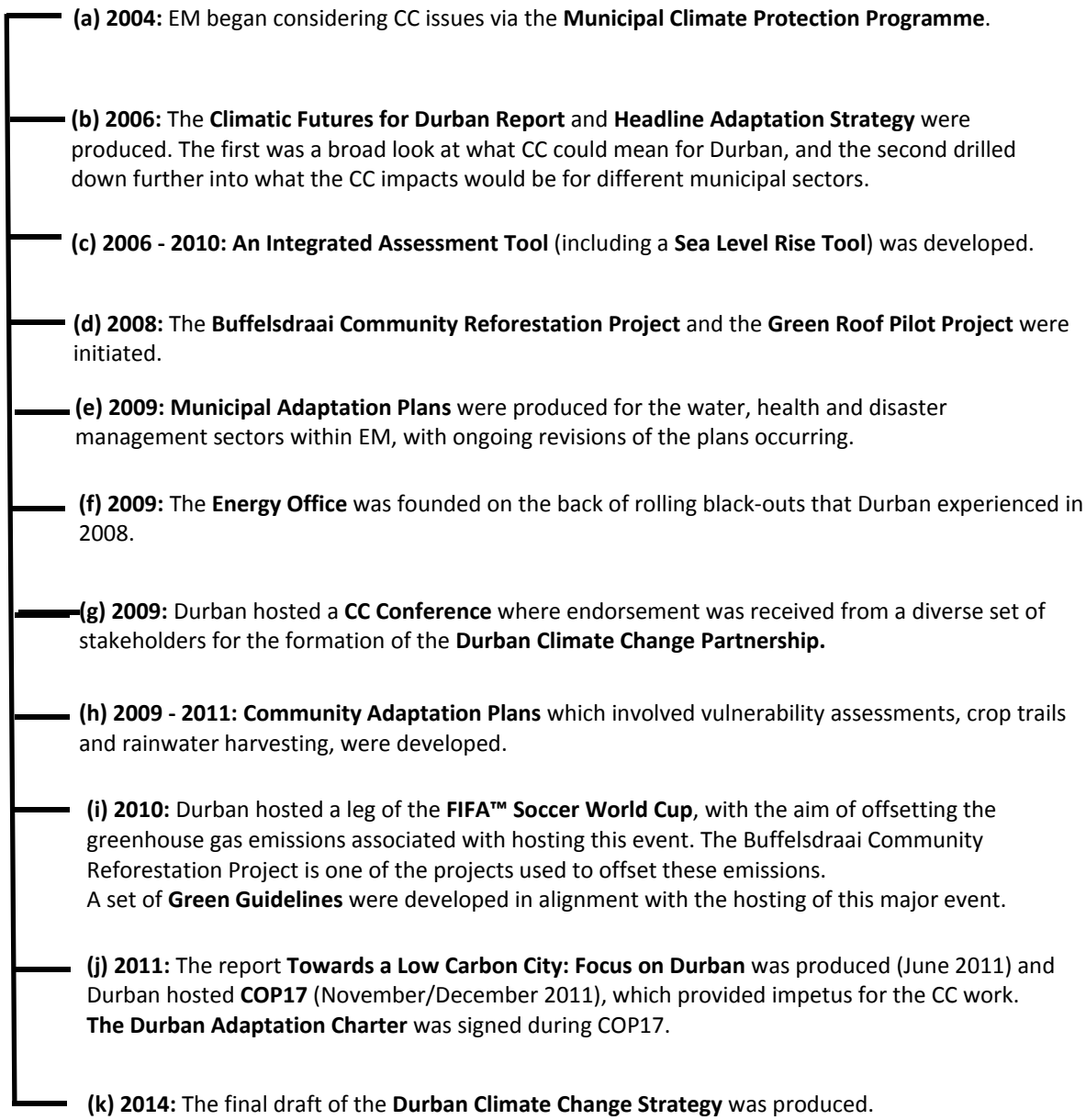

Figure 6.2. Timeline of selected CC milestones in EM

6.3.1. The Municipal Climate Protection Programme

The Municipal Climate Protection Programme (Figure 6.2[a]) was initiated in 2004, post participation of the then Head: Environmental Management Department in an advanced international environmental management programme, which informed this influential municipal staff member of the importance of considering CC in the Durban context (Roberts & O'Donoghue, 2013). With hindsight the Municipal Climate Protection Programme can be represented as occurring in phases (from impact assessment to adaptation planning, to developing a CC toolkit, to mainstreaming adaptation), and is presented as such by EM officials (Tooley & O'Donoghue, 2012). The thinking and

understanding derived from earlier projects has influenced later ones, but the programme has also progressed opportunistically and organically, as and when financial and human resources became available. Roberts and O'Donoghue (2013) indicate that the programme has been phased and opportunistic, where lessons learnt along the way have influenced the programme's development, which is reflective of the municipality's learning-by-doing approach, discussed in Section 6.8.2.

6.3.2. Work on CC impacts for the eThekwini Municipal Area

During 2006, two CC impact reports were produced (Figure 6.2[b]), both of which did not enable any additional action, but instead sat on official's shelves. Roberts and O'Donoghue (2013) indicate that the failure of the Headline Adaptation Strategy to enable action, may have been due to the fact that: (a) the report was too high-level and all-encompassing; (b) there was a lack of human and financial resources at the time to enable its recommendations; and (c) developmental challenges were seen as more important than CC, which is perceived as an unlikely and distant threat.

The impact assessment work was taken forward between 2006 and 2010, with the development of an Integrated Assessment Tool, which incorporated a Sea Level Rise Tool (Figure 6.2[c]). The aim of the tools was to spatially represent CC impacts for the EM area allowing decision makers in the municipality to factor CC into their decisions. Barriers and enablers experienced during production and use of the Integrated Assessment and Sea Level Rise Tools are discussed in Section 6.6.1.2.

6.3.3. Pilot initiatives and windows of opportunity

The BCRP (Figure 6.2[d]) is a pilot reforestation initiative that forms part of a broader reforestation programme that EM has undertaken in areas such as Buffelsdraai, Inanda and Umgeni. The development of these reforestation initiatives has resulted in the Community Ecosystem Based Adaptation concept, which *"highlights the mutually beneficial and positively reinforcing relationship that exists between ecosystems and human communities"* (Roberts & O'Donoghue, 2013, p. 311). The BCRP process is described in Textbox 6.1 and Figure 6.3. In 2014, the BCRP received a gold standard (highest level) Climate, Community and Biodiversity Alliance Validation Certificate, which indicated that the project adheres to international standards of ensuring significant CCA benefits for both human and biological communities (EPCPD, 2014).

The Green Roof Pilot Project (Figure 6.2[d]) tests the viability of planting indigenous species on urban roofs, to improve urban resilience to CC by increasing inner-city biodiversity, ameliorating the urban heat-island effect and reducing surface run-off. The CC mitigation benefits of the project have also been investigated, in relation to how reduction in the temperature of the roof surface may lead to reduced use of air-conditioners (EM, 2009).

Both the BCRP and the Green Roof Pilot Project received impetus when windows of opportunity (see Section 6.8.7) such as EM hosting the World Cup (Figure 6.2[i]) and COP17 (Figure 6.2[j]) occurred. Alongside COP17, EM in partnership with the South African Local Government Association, South African Cities Network, the national Department of Environmental Affairs, and ICLEI: Local Governments for Sustainability[26] (referred to as ICLEI in the rest of this thesis), hosted the Durban Local Government Convention. During this event the Durban Adaptation Charter was signed by 114 signatories, representing 950 local governments. Those that sign the Charter commit to assisting local communities in responding to CC risks by enabling local climate action (Durban Adaptation Charter, 2014). As of October 2014, the Durban Adaptation Charter had 1000 signatories (EPCPD, 2014), which include all four of the case study municipalities in this thesis.

[26] ICLEI is a not-for profit global association of local governments who are committed to promoting sustainable development (Mukheibir et al., 2013, p. 25).

Textbox 6.1. The Buffelsdraai Community Reforestation Project (Information derived from EPCPD [2014] and Greater Capital [2011])

The BCRP aims to build an indigenous forest in the buffer zone around the Buffelsdraai Regional Landfill site, north of Durban. This buffer zone must be maintained by law to separate the surrounding communities (Buffelsdraai and Osindisweni) from the landfill site. Prior to November 2008 this buffer zone was used for marginal sugarcane farming (see Plate 6.1), by farmers who leased the land from EM. These leases have been discontinued in a piecemeal fashion to enable the project. The BCRP is being used to offset 50 000 of the 307 208 tonnes of CO_2 equivalent emissions associated with Durban hosting a leg of the 2010 FIFA™ Soccer World Cup. The project aims to reforest 520 of the 800 ha buffer zone, with the existing riverine forest and woodland remaining intact (EPCPD, 2014). The project aims to not only contribute to offsetting World Cup emissions, but also to improve the ecosystem services of the area, enhance biodiversity and contribute to the socio-economic needs of the surrounding communities. These communities are considered peri-urban and impoverished, with over 90% of project beneficiaries living below the national poverty line (Greater Capital, 2011). A pioneering model is being implemented (see Figure 6.3), where community members are trained as 'treepreneurs' to source and propagate indigenous seeds. The trees they produce are then traded at 'tree-stores' for groceries, building materials, school fees and even driver's license lessons. Community members also benefit from permanent and temporary jobs (374 jobs created: 24 full-time, 10 part-time, 340 temporary), where they are employed to dig holes, plant trees, prevent fires and maintain the nursery (EPCPD, 2014). The project has also run a number of educational/training initiatives, not only in relation to how to be a 'treepreneur', but also environmental and business training. The project offers benefits relating to CCA, CC mitigation, ecosystem services, and biodiversity, as well as community upliftment (see Section 6.8.6). The BCRP was initially funded by international funders (e.g. DANIDA), but is now fully funded by EM.

Plate 6.1. Photograph showing sugarcane farming in the buffer zone of the Buffelsdraai landfill site (image courtesy of Wildlands)

Figure 6.3. The BCRP process based on the Wildand's Indigenous Trees for Life Model (images courtesy of Wildlands)

6.3.4. Municipal adaptation planning

In 2009, EM embarked on sector-specific Municipal Adaptation Plans (Figure 6.2[e]). These plans were produced for sectors identified in the Headline Adaptation Strategy as particularly vulnerable to CC, i.e. water, health and disaster management. The Municipal Adaptation Plan process involved regular meetings between staff of the Environmental Planning and Climate Protection Department and consultants contracted to run the project, with sector representatives. In these meetings, sector representatives were informed of the potential impacts that CC could have for their sector, leading to the development of sector specific action plans for the implementation of adaptation interventions. Officials within the relevant sectors then used a Multi-Criteria Assessment (produced by the consultants) to prioritise their sector-specific interventions. What resulted was a Municipal Adaptation Plan report which houses large tables filled with interventions, responsible parties and timeframes for completion of the work (Environmental Resources Management, 2009). Post the Municipal Adaptation Plan report, meetings were continued between Environmental Planning and Climate Protection Department staff and the sector representatives, to monitor progress. Like was the case for the CoCT's CCA Plans of Action (see Section 8.3.7 and Taylor, in press), these meetings relied to a large extent, on the environmental departments initiating and driving the interactions.

6.3.5. Community adaptation planning

Community adaptation plans (Figure 6.2[h] and see EM, 2011c) were developed via a 'climate smart communities' project. This project involved conducting a vulnerability assessment of a rural and urban community, conducting crop trials to assess the viability of traditional and potential replacement crops in different locations, and testing the palatability of alternative crops. Micro-scale water technologies were also investigated. Findings of this work were that if water could be provided and planting dates shifted, the increased temperatures which result from CC could be beneficial for crop production (Roberts & O'Donoghue, 2013), and that the palatability of replacement crops was a vital consideration in their potential use.

Linked to the municipality's community adaptation planning was the implementation of a community initiative at a peri-urban school (see EM, 2011c). School grounds were stabilised using vetiver grass and tyres, and rainwater harvesting tanks and drip irrigation were installed for the irrigation of a community vegetable garden. This project was highly beneficial to the school as it stabilised the banks, which regularly collapsed into the school building after heavy rains. It also provided a safe place for children to play, and increased food production. In spite of this, the project has stalled, due to lack of inter-governmental collaboration (see Section 6.5.1.2). Another community project, used theatre to try and educate community members about CC. The project had limited success as community

members were not dedicated to the project, many of them not arriving for the final production of the play, which was then called off. The lack of success of this project has likely contributed to municipal official's perception of community apathy (see Section 6.5.1.3).

6.3.6. The Energy Office

The Energy Office was founded in February 2009 (Figure 6.2[f]), on the back of the rolling black outs that much of SA experienced (a window of opportunity, see Section 6.8.7), and the call from national government for an electricity consumption reduction of between 10 and 15%. Hence, the initial focus of the Energy Office was to reduce Durban's consumption of grid electricity, through energy efficiency and/or renewable energy, and this focus still remains today to a large extent (EM, 2014a).

A project commissioned by the Environmental Planning and Climate Protection Department, but taken forward by the Energy Office, was a piece of work done by the Academy of Science of SA, In 2010 and 2011. The Academy assessed ways in which Durban could become a low carbon city, and presented their recommendations within the report entitled: 'Towards a Low Carbon City: Focus on Durban' (ASSAf, 2011) (Figure 6.2[j]).

6.3.7. Promoting CC via events

EM has hosted numerous events that have assisted the CC cause. A case in point is the first Durban CC Conference (held in May 2009, see Figure 6.2[g]), where endorsement was gained for the formation of the Durban CC Partnership, which brought together government, business and industry, and civil society representatives, to tackle Durban's CC issues. Unfortunately the Partnership was disbanded, although many lessons were learnt (discussed further in Section 6.5.2.2).

6.3.8. The Durban CC Strategy

In September 2014 the final draft of the Durban CC Strategy[27] was released (Figure 6.2[k]). The aim of the strategy is to guide the city as a whole with regards to mitigating and adapting to CC. The development of the strategy has followed a participatory process, involving the use of surveys, reference groups, working groups, as well as encouraging comments on draft reports. The participatory nature of the strategy has been used to generate buy-in, and encourage all stakeholders and sectors to plan for CC and implement CC actions[26].

6.3.9. The Integrated Development Plan and CC

EM's role as a CC leader is represented by the numerous and strong references to CC in the municipality's Integrated Development Plan, its core planning document. The 2014/15 review of the

[27] See: http://www.dccs.org.za/

Integrated Development Plan (EM, 2014a) deals with CC throughout the document, with a specific section on CC under the detailed situational analysis of the municipality. Within this section CC projections and impacts for the EM area are given and two areas of intervention highlighted: (a) The Durban Adaptation Charter; and (b) Durban's CC Strategy. CC is also specifically dealt with under the following two sections: (a) 'Strategic Focus Area: Climate Protection Planning'; and (b) 'Programme 1.4: Develop and implement a Municipal Climate Protection Programme.' In the latter section, EM's focus on urban resilience is highlighted (see Section 2.3.2.1 and EM, 2014a, p. 129) as well as the developmental and social justice elements of CCA (Section 1.4.3): *"CC is a threat to sustainable development and could undermine poverty alleviation efforts and have severe implications for food security, clean water, energy supply and environmental health"* (EM, 2014a, p. 128).

Other examples of CC being incorporated in the Integrated Development Plan are it being listed as a key developmental challenge, and a key issue for safety as well as food security. Under the natural environment section of the Integrated Development Plan, it is indicated that CC will negatively affect the biodiversity of the City and may lead to increases in the ranges of certain alien species (EM, 2014a). The strong links made between CC, biodiversity and ecosystem services are revealed by the following excerpt from the plan: *"the protection of local ecosystems will make a significant contribution to the city's ability to adapt to CC impacts, such as the increase in extreme weather events, sea level rise and more variable rainfall patterns"* (EM, 2014a, p. 58). The municipality's community reforestation programme (of which the BCRP is a part) is indicated to be *"a holistic approach to addressing biodiversity conservation, CC mitigation and adaptation needs, with demonstrable rural development and poverty alleviation benefits"* (EM, 2014a, p. 62). This statement alludes to the multiple benefits of the BCRP (see Section 6.8.6) and EM's prioritisation of the poor (social justice framing, see Section 1.4.3). An important enabler of the CC work is that it is linked to municipal budget via the Service Delivery and Budget Implementation Plan Project Matrix. *"Large scale programmes for implementation of biodiversity and climate protection, and for green job creation"* (EM, 2014a, p. 130) are mentioned in the matrix, as well as the implementation of the Durban Adaptation Charter and CC Strategy (EM, 2014a).

EM's focus on social justice issues, such as prioritising the poorest and most vulnerable communities is made clear throughout the Integrated Development Plan. For example, by linking poverty, the natural environment (its ability to provide ecosystem services to poor communities), and CC impacts (EM, 2014a). Other interventions that focus on the poor and marginalised, include: (a) providing free electricity to poor households; (b) investment nodes, infrastructure development and service delivery in poor areas; (c) rural development and promotion of sustainable livelihoods (especially in relation to food security); and (d) social development initiatives to improve community/municipal relations and

social cohesion (e.g. building more clinics and police stations, organising civic/municipal events) (EM, 2014a). A section in the Integrated Development Plan also deals with gender mainstreaming and the promotion of women in the EM area (EM, 2014a). Making the links between these broader social justice interventions and CC (as is presently the case in relation to the natural environment), could be a useful way to improve inter-departmental collaboration and mainstream CC within the municipality.

6.4. KEY BARRIERS AND ENABLERS IDENTIFIED

The barriers and enablers experienced in EM (see Figure 6.4) exist across all three of Moser and Ekstrom's (2010) adaptation phases; i.e. understanding, planning and managing (Section 3.3.1). These phases were not followed sequentially though; EM's CC work moved from recognising the need to enable CC action (Sections 6.3.1 - 6.3.2), to implementing pilot projects (Section 6.3.3), back to the understanding and planning phases, with consideration of more strategic interventions, such as the Durban CC Strategy (Section 6.3.8). This is a useful model to follow, as it means that the strategising that EM conducts as part of the Durban CC Strategy - occurring 10 years after the CC work was initiated - is not just based on science and theory, but also experiential evidence within the context of Durban (see Section 6.8.2: learning-by-doing).

The barriers to CCA and CBA experienced in EM, were found to exist within all three of my framework's groupings, i.e. social, resource and contextual barriers. I found that organisational and discursive, as well as cognitive and normative barriers often occurred together. EM has experienced multiple enablers to its adaptation work, which are discussed in Section 6.8.

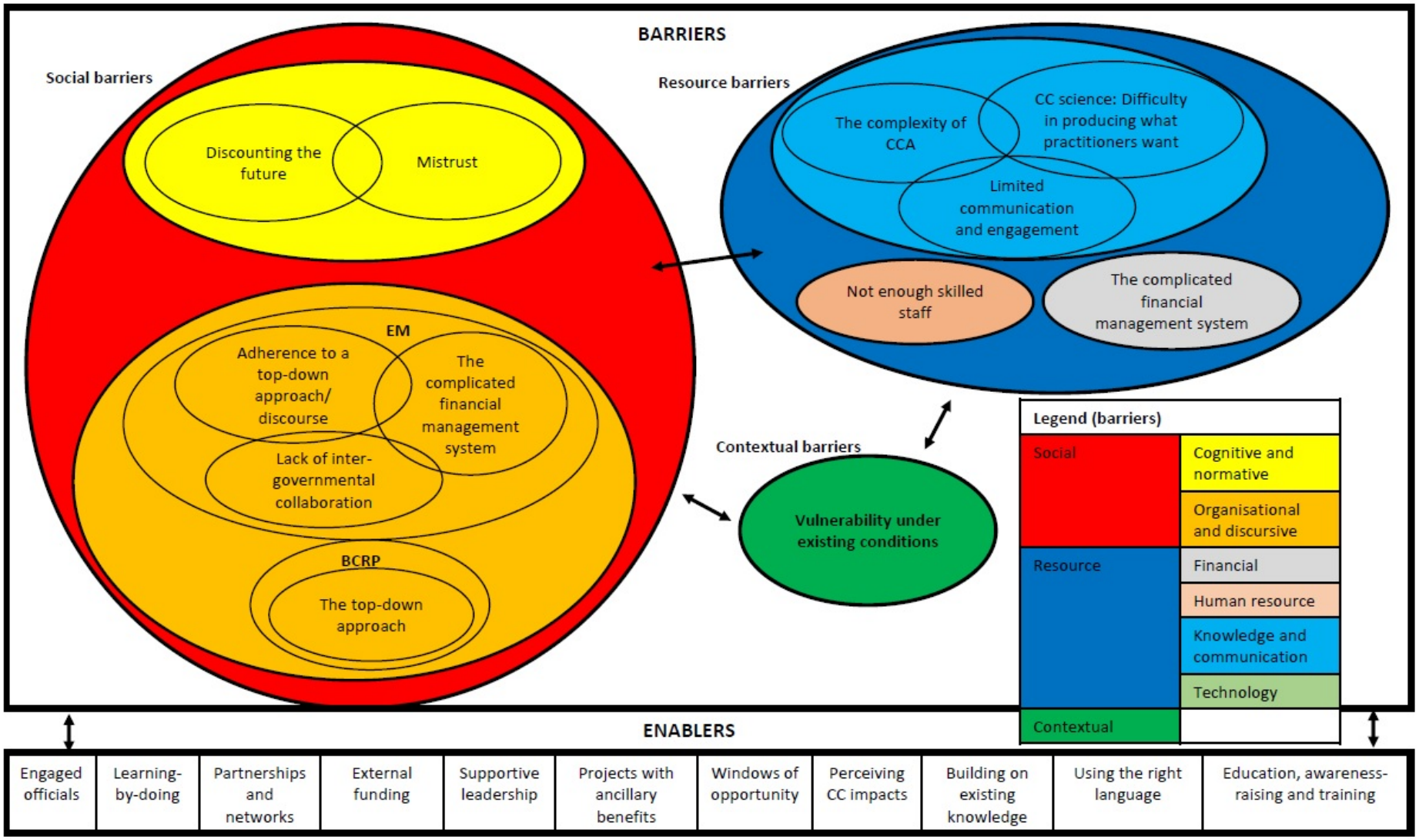

Figure 6.4. Overview of the barriers and enablers identified in EM

6.5. SOCIAL BARRIERS

6.5.1. Organisational and discursive barriers

The organisational and discursive barriers identified were separated into those relating to the organisational and discursive approaches of EM (Sections 6.5.1.1 - 6.5.1.3), and those relating to the how the BCRP is run (Section 6.5.1.4).

6.5.1.1. EM: The complicated financial management system

Interviewees (EM 1 - 5) indicated that several policies hinder the planning and implementation of CCA[28]. These mainly relate to the complicated and highly structured procurement and supply chain management policies that exist in EM[29], which hinder the flexibility and learning-by-doing that CCA requires (Adger et al., 2005). The procurement system has been revised and refined to increase the stringency with which municipalities govern their financial affairs, which has led to there being numerous sets of legislation, policies and regulations (EM, 2014c)[30]. The process of procuring goods and services for CCA, as opposed to business-as-usual service delivery (which was what guided the policies), has therefore become complicated. Hence, one could question whether the proviso in the Municipal Finance Management Act that municipal officials should be given the necessary resources or opportunities to be able to meet the competency levels to work with the procurement system (Government of SA, 2003), is being adhered to. Municipal staff indicated that this difficult to manage system often delays the initiation, implementation and management of CCA programmes and plans. EM 1 said:

> *I think the big challenges that we have, I think one of the main ones, is procurement. I mean that's probably my biggest challenge, my biggest nightmare… One of the issues is at the branch level, not having sufficient staff, not having sufficient people who know the systems. If we had*

[28] Coded as 'counter-productive policies for CC', which received 19 references in the semi-structured interviews.
[29] Coded as 'procurement systems', which received 14 references in the semi-structured interviews.
[30]

- The Municipal Finance Management Act (MFMA) (No. 56 of 2003).
- The Municipal Supply Chain Management Regulations (May 2005).
- The National Small Business Amendment Act (No. 26 of 2003).
- The Preferential Procurement Policy Framework (PPPFA) (No. 5 of 2000).
- The Preferential Procurement Policy Framework Regulations (10 August 2001).
- The Broad-Based Black Economic Empowerment Act (No. 53 of 2003.
- Municipal Supply Chain Management Regulations.
- The Preferential Procurement Policy Regulations.
- EM's Target Procurement Policy.
- EM's Supply Chain Management Policy.
- EM's Standard of Procedures.
- EM's Code of Conduct.

a dedicated team who knew exactly what the procurement system was about and had support from procurement, which we don't, that would be a big difference…

This barrier can be seen as an intersection of organisational and human resource barriers, leading to financial barriers, as articulated by EM 2:

For us the biggest hurdles are the financial regulations, we are just hitting a wall on everything, if you look at the MFMA[31] *and all the requirements with that, all the associated requirements coming from Treasury in terms of your auditability… We're battling to manage… and we ourselves are now going to write in a full-time financial person into that space. It's just not our skill set, I mean we're biologists… what do we know about audit trails and so on… We've just had a detailed audit last year, and it was an absolute freaking nightmare. There is no way that outer Klokkelaan could manage, they can't, and that's the problem, even if national turned around and said from a capacity point of view, we're going to give you 36 million, they could not meet the financial requirements… That's the problem, ah, it requires a huge organisation, and even our organisation is not big enough to manage that.*

The value that the procurement system places on price (to save the municipality money) as opposed to functionality (skills) in choosing a service provider, also hinders CCA work which requires specific skills which come at a premium. Long term contracts with organisations outside of the municipality are also difficult to facilitate via the financial management system, and this causes loss of learning and institutional memory. Additional rules and regulations have been added to this already complicated system, as EM officials and politicians have been implicated in a number of illegal procurement practices. Procurement staff are now particularly cautious about being involved in a programme or project that attempts to use the procurement system innovatively. De Visser (2012, p. 125) asserts (in relation to his research in the CoCT), that there are *"interpretational challenges that exist with respect to the intersection of CC action and financial management rules"*, and that the criminalisation and politicisation of the municipal financial management system has made civil servants extremely cautious and often opposed to innovative interpretation of its laws and policies.

Discussion on the financial management system of the municipality was taken forward during the feed-back session, where EM 1 put the problem into perspective. He indicated that in fact this challenge is a symptom of a much broader issue relating to the restructuring of local government in the 2000s. This restructuring led to municipalities having to manage larger areas (*"following the consolidation of the different local authorities, the land area of Durban increased resulting in 68% of rural land being included in the municipal area (80% of which is under traditional tenure)"* [EM, 2014a,

[31] Municipal Financial Management Act.

p. 64]), and increased population sizes, making their ability to perform more difficult. In his opinion, this has led to a culture within EM (and this could be expanded to include other South African municipalities) of staff feeling strained and over-worked and hence unwilling to stray from business-as-usual[32], especially in relation to financial management. This is further entrenched by the fact that deviating from business-as-usual, will lead to increased workload, while not improving performance ratings and hence opportunities for bonuses (a disincentive for innovation).

6.5.1.2. EM: Lack of inter-governmental collaboration

EM has not relied on national or provincial incentives or directives to drive its CC work; this independence has been influenced by and influenced the lack of inter-governmental coordination that interviewees discussed. EM 2 and EM 3 (respectively) discussed the lack of collaboration between EM and provincial government in relation to EM's CC work:

> *I increasingly wonder why we have province, because I don't see a real role for province in any of these things. This is a debate that needs to happen between national - that provides the framing and often the funding flows, and local - who will do in many instances…*
>
> *We have had interactions, but it hasn't been constructive, because there isn't that much to engage on…*

The lack of interaction with provincial government, but recognition of the need to work with national government (expressed by EM 2 and 3), likely relates to the fact that metropolitan municipalities (which have significant human and financial resources) are able to operate relatively independently from their provincial counterparts, but are impacted by national legislation and directives. This being said, lack of municipal/provincial government collaboration can present challenges, as was experienced when the Environmental Planning and Climate Protection Department initiated a project at a local school (discussed in Section 6.3.5), and discovered post phase one of the project that infrastructure could not be installed at the school without provincial government approval (as they owned the land) (Roberts & O'Donoghue, 2013).

6.5.1.3. EM: Adherence to a top-down approach and discourse

EM's adherence to meeting targets within short timeframes (associated with political terms of office), and the fact that it operates via tight monitoring systems[33], restricts the flexibility and reflexivity that is useful for CCA and CBA. It also hinders collaboration with chiefs and headmen, who govern, with

[32] The code – 'business as usual' received 8 references in the semi-structured interviews.

[33] An advantage of these tight monitoring systems (e.g. the procurement system and the performance management system) is that they ensure that checks and balances are in place, and have played a large role in EM having the best record of unqualified audit reports in the country (EM, 2011a), which encourages external investment in the municipality.

municipal officials, large portions (43% according to EM 17) of the EM area. This was explained by EM 17:

> *From municipalities to traditional authorities, we find ourselves switching from a system that is target/goal driven and long-term visions. But if you go to the traditional authorities, you find that they are living from a day to day basis. They don't have long-term goals, or structure. Becomes difficult to bring in new concepts…*

The top-down approach that EM adheres to favours step-wise implementation of bounded projects, which are often developed on the basis of projects successfully implemented elsewhere (discussed in Roberts & O' Donoghue, 2013, p. 315). But adaptation has to be based on the specific context; not taking context into account by trying to apply procedures that worked elsewhere is unlikely to lead to successful CCA and/or CBA. In reference to CBA specifically, EM 2 states: *"it is a really nuanced interaction, it's not this call one big city meeting and you've got CBA, you've got to get down to KwaDabeka, and we've probably got to get down to the streets in KwaDabeka… and we're just not set up for that…"* The time and resources needed to enable these fine-scale interactions with community members is a major stumbling block. Roberts and O'Donoghue (2013) reporting on EM's adaptation work indicate that lack of social cohesion, represented by community apathy, high levels of crime, a weak sense of community, mistrust of leadership and disagreements between political and traditional leaders, hindered the achievement of meaningful CBA.

The organisational and discursive barriers discussed in this section relate to temporal issues, as different stakeholders (community members, traditional leaders and government officials) make decisions within different timeframes and this influences their ability to work together. They also relate to spatial issues, as it is not just EM that utilises the top-down approach, but government in general, and hence a question remains as to whether EM can break from this approach independently, or whether broader scale changes need to occur for government to undertake more flexible work streams. Changing the fundamental attributes and/or discourse of governance systems would likely require transformational adaptation (IPCC, 2014, and see Section 2.3.2.3).

6.5.1.4. BCRP: The top-down approach

The BCRP has been run in a rather top-down fashion[34] by EM, as most decisions are made in management meetings, which community members do not attend. The top-down management of the project also relates to the EM/Wildlands partnership. EM's strong ownership of the project has

[34] Coded as 'top-down projects = reliant communities' which received 35 references in the semi-structured interviews.

restricted some of the creativity and innovation that Wildlands could have brought to the project, as EM 5 states: *"they have become contractual rather than catalytic…"*

Due to the top-down fashion with which the BCRP has been run, community members involved in the project have become dependent on externally supplied project benefits, which presents a challenge in relation to how the project team can exit the area once the buffer zone has been reforested. As EM 7 states in relation to the project ending: *"it's going to be very, very bad news when it comes to an end, because they are working here, when the project comes to the end, it means that they go back to poverty again…"* This is a problem that the BCRP management team is already facing; EM 6 indicated that enough trees have been collected to complete the reforestation process. Community members have learnt a valuable skill set related to propagating trees, but this skill set may be difficult to use in other economic pursuits.

A major benefit of the BCRP is the improvement in food security that has occurred due to community participants gaining food from the 'tree-stores' (Greater Capital[35], 2011). The ramifications of community members receiving food as part of their involvement in the project is that it frees household income for other expenses, and improves children's attendance at school ('no food' being cited as one of the reasons why children did not attend school) (Greater Capital, 2011). Reduction of the number of 'tree-stores' due to enough trees having been propagated for the project area, may have negative implications for community food security, household income and education; particularly when one considers that during project involvement, community members have become less reliant on family networks and food gardens for their food needs (Greater Capital, 2011). Moreover, many of the 'treepreneurs' have developed an affinity for what they do, as EM 6 states: *"they love to plant trees; it's inside them, so they can't just leave it."* At the time of the interviews, the number of 'tree-stores' had been reduced and the amount of trees traded per 'treepreneur' had been limited, which was accompanied by community complaints and loss of trust in the project. EM 9 said, in relation to the 'treepreneurs': *"they are struggling with this on and off, they changed the tree-stores, they are going to buy once a year…"*

In an attempt to manage this problem, 'treepreneurs' have been encouraged to become 'wastepreneurs'; collecting recyclable waste and trading it for goods. The community response to these changes vary between those that have been brought on-board effectively and are more adaptable, and those that feel misinformed and let down by the project; represented by the following

[35] Greater Capital is a not-for-profit organisation (see: http://greatercapital.co.za/) that was contracted to complete a social impact assessment of the BCRP in 2011. The social impact report contributed to the BCRP receiving the Climate, Community and Biodiversity Alliance Validation Certificate (see: http://www.climate-standards.org/).

responses from EM 9 and EM 10: *"That is a problem now, and they are crazy, and they have just introduced the recycling, and they are crazy"* and *"about the recycling, they didn't come… to inform the tp* ['treepreneur'] *properly, to call maybe the meeting with the tps, and talk to them about the recycling, because they are confused even now…*" Many of the homesteads' yards that I visited were full of trees that could not be collected, leading to 'treepreneurs' trying to seek out ways to sell these trees, but with little success, as they did not have the necessary networks and business skills to establish small business enterprises.

An observation that Greater Capital raised (based on focus group discussions undertaken as part of the social impact assessment) is that 'treepreneurs' did not fully understand the objectives and rationale of the BCRP (only a few 'treepreneurs' knew where their seedlings were going) (Greater Capital, 2011). Lack of community understanding, as reflected in Greater Capital's observation, is likely to negatively influence the long-term sustainability of the forest; community members that value the ecosystem services that the forest provides are less likely to utilise its resources for socio-economic gains post project completion (e.g. harvesting hardwoods and hunting). Hence, key lessons that can be drawn from the BCRP is that projects that are target driven and operate at the community level need to: (a) build in community education components; (b) ensure that expectations related to the project are well managed; and (c) develop an exit strategy from early on in the project.

The top-down approach, discussed in this section, aligns with the CC discourses discussed in Section 2.2.3, and what Winsvold, Sokke, Klausen, and Saglie (2009) have defined as the hierarchical mode of governance, where decisions that affect subordinate units in the hierarchy are made by a central authority. The advantage of this approach is that extensive implementation of activities can be achieved, due to the coercive nature of this mode of governance (Winsvold et al., 2009). The disadvantage being that feedback from subordinate units within the hierarchy is often poor (Winsvold et al., 2009). This approach to governance is a particular challenge/barrier to communication and engagement (see Section 6.6.1.3) and CBA (see Section 6.9).

6.5.2. Cognitive and normative barriers

Cognitive barriers were identified in relation to the inward focus of people who discount the future (Section 6.5.2.1), and mistrust between stakeholders (Section 6.5.2.2). A cognitive/normative barrier was also identified in relation to community members linking changes in the weather to God or their religious beliefs[36]. It is difficult for these community members to link what is seen to be in 'God's domain', with human influence on climate, which is not amenable to human management (Klein et al., 2014). EM 4 indicated that these more nuanced issues are being considered in the development

[36] Coded as normative barriers, which received two references in the semi-structured interviews.

of the Durban CC Strategy (Section 6.3.8): *"we've paid a bit of attention to that with the CC strategy, to try and make our message be put forward in a way that aligns well with cultural beliefs…"*

6.5.2.1. Discounting the future

EM 1 and 2 felt that most people, especially the younger generation, do not identify with CCA because it requires working together and considering future impacts, two things very difficult for an individualised and 'now-based' generation.[37] They also indicated that in a country like SA, where significant socio-economic challenges exist, most people simply try to get through each day, as opposed to considering the impact of CC on their future existence. They discussed how people view change as inevitable, and something they'll cope with when it eventuates. EM 5 spoke about how it is human nature to aspire to material gains, such as living in a big house and owning a fancy car, which runs counter to CC's call for reduced consumption. Discounting the future was also discussed by EM 1 in relation to the municipality reacting more effectively to short-term disaster linked events, as opposed to more creeping, insidious issues like CC (discussed further in Section 8.6.1). This barrier leads to reactive, as opposed to anticipatory adaptation, which is motivated for by CCA and CBA advocates if CC is to be adequately dealt with.

6.5.2.2. Mistrust

Mistrust[38] was discussed in reference to relations between civil society, government and the private sector, which contributed in part, to the Durban CC Partnership (Section 6.3.7) being unable to progress past the issues of process and ownership in the two years it existed. Civil society[39] in particular was sceptical of being part of a partnership where government or business had too much sway and did not want to be manipulated into endorsing government or business-benefiting objectives at the expense of broader civil society needs. This barrier was likely contributed to by the fact that EM funded the Durban CC Partnership and hired the consultants that facilitated it, as well as the fact that meetings were held in municipal owned buildings. Cartwright et al. (2012) indicated that due to the fact that CoCT's CC Think Tank (see Section 8.9.1) existed outside of the partnership's organisations, these organisations could be criticised, which contributed to the Think Tank's rigour and continuity.

Other barriers that contributed to the disbanding of the Durban CC Partnership were that: (a) the municipality legislatively could not fund the partnership and sit on the steering committee; (b) other partners were unable to obtain enough funds to run it independently; and (c) stakeholders did not

[37] Coded as 'inward focus of people', which received 10 references in the semi-structured interviews.
[38] The code 'mistrust' received 6 references in the semi-structured interviews.
[39] The code 'municipal/civil society communication break-down' received 8 references in the semi-structured interviews.

want to be involved in a 'talk shop' without tangible outcomes. Roberts and O'Donoghue (2013, p. 313) cite *"early distrust among the groups; lack of influential and uniting leadership; insufficient long-term commitment from partners; and the inability to secure funding"* as some of the reasons why the Partnership was not successful.

Linked to the barrier of mistrust, is the general lack of strong networks between EM and civil society stakeholders; an issue raised by EM 2 and EM 26. Contributing to this mistrust are personality clashes between key municipal and civil society stakeholders, as well as a broader issue of civil society not trusting the municipality; due to poor service delivery in some areas, corruption, and the municipality not fulfilling its promises (EM, 2008). Community members surveyed as part of a vulnerability assessment (Section 6.3.5) indicated their dissatisfaction with community leadership (e.g. coordination issues between traditional and political leadership structures, see Section 6.5.1.3) and service delivery.

Building trust between the municipality and its residents will require that the municipality engages in more transparent and participatory processes, which are complex and time-consuming, as they require that municipalities lose a certain amount of control over decision making, overcome community apathy, and ensure that decisions respond fairly to multiple concerns held by heterogenous communities (Few, Brown, & Tompkins, 2006). Trust-building depends, in part, on civil society seeing that their inputs influence municipal decisions; leading to them becoming more engaged in municipal planning and project implementation. This would require that the municipality loses some control over decision making, which would counter the top-down approaches discussed in Sections 6.5.1.3 and 6.5.1.4. Improving municipal/civil society relations via trust-building is essential for both distributive and procedural justice (Adger, 2013), and therefore social justice (Section 1.4.3).

6.6. RESOURCE BARRIERS

6.6.1. Knowledge and communication barriers

6.6.1.1. The complexity of CCA

The knowledge and communication barriers revealed in the interviews related mainly to the complexity of CCA[40], which is something that was perceived by the interviewees, and hence could also be seen as a cognitive barrier. EM 2 described CCA as difficult to manage and less obvious and tangible than mitigation: *"adaptation is messy, it's chaotic, it's difficult, it's kind of spread all over the place… it's less tangible, less obvious, which is problematic for adaptation".*

[40] Code – 'complexity of CCA' received 24 references in the semi-structured interviews.

This makes CCA a difficult concept to sell to politicians, especially as it requires bold, expensive decisions, with benefits that may not manifest in political timeframes. EM 2 said:

> *And you quite quickly run out of no regret options, there are low hanging fruit and you can intervene, but often you get into a space where you're going to have to make pretty bold decisions about something that might not happen. So I think adaptation, the complexity and chaos of it is its challenge. Um, also, there's just no ear for it in the climate fraternity. I am constantly amazed that it is predominantly a mitigation debate, CC is still mitigation in the minds of everyone.*

EM 2 felt that adaptation was at a further disadvantage because it is "*more about public good, less about private enterprise"*. However, Shalizi and Lecocq (2009) state that because mitigation reduces all CC risks everywhere, it is a public good (requiring collective action), and because adaptation reduces certain CC risks in certain places, it is private good (it benefits a certain individual or group of individuals in a certain locality).

A further contributing factor to the complexity of CCA is that separating adaptation from good development is often difficult to do; good development often has adaptation benefits, and development deficits can add to CCA deficits (Revi et al., 2014), which makes monitoring and evaluation of CCA difficult. EM 2 indicated that a significant challenge for CCA work *"is that it has so many faces"*, and said:

> *When we talk about adaptation, we are talking about so many things, um, that it's hard to brand it and sell. So the first thing is that I think the identity of adaptation is very very difficult to actually invest in the political mind, because it's disaster risk reduction, it's health, it's food security, it's ecosystem based adaptation, it's community based adaptation, and how does any of this differ from good development… But if you think that adaptation is part of good development then you have entirely missed the boat, but the question is how is it different, and that distinction I don't think the discourse is well enough developed... So it's hard to sell it because it is everything… The time lines are also confounding because a lot of the benefits of adaptation are not going to be seen in a political term, and also the uncertainty of the interventions…*

The issue of delineating CCA/CBA from development/community-based development is a challenging one, as they can be seen as competing for policy attention and funding (Tanner & Horn-Phathanothai, 2014). CCA and development can either counter each other or possess strong synergies, leading to the recognition that if CC actions and development decisions are not considered together, both risk

being counterproductive and ineffective (Tanner & Horn-Phathanothai, 2014, and see Section 2.3.2.1 for discussion on Eakin et al.'s [2014] generic and specific capacity).

6.6.1.2. CC science: difficulty in producing what practitioners want

EM 2 indicated that downscaling to determine CC impacts is not at a point where it can be useful to city planners, who are requesting specific and detailed local-level information about the impacts that they should plan for (see risk management approach in Section 2.3.1 as well as Section 4.3.3.2). The issue of uncertainty in CC modelling was discussed by EM officials at various meetings and conferences[41]. Uncertainty arises from: (a) the CC models themselves, due to an incomplete understanding and difficulty modelling the real climate system; (b) uncertainities in predicting human-made emissions; and (c) uncertainities which arise via the downscaling process (MetOffice, 2014), all of which make it difficult for practitioners to utilise CC projections with confidence in proactive decision making processes (Shalizi & Lecocq, 2009).

These issues manifested when EM developed an Integrated Assessment Tool (see Section 6.3.2). The aim of the tool was to help decision makers to be able to identify CC risks spatially in relation to vulnerable communities, biodiversity priorities and infrastructure resilience[42] (Golder Associates, 2010). The tool could only be used for macro-scale impacts due to climate modelling uncertainty and lack of data availability (Golder Associates, 2010), making it difficult for municipal technicians and planners to use. The tool has also had limited uptake with higher level municipal stakeholders, due to its complexity (Roberts & O'Donoghue, 2013) (relates to Section 6.6.1.1). In essence, it was too detailed for high-level decision makers and not detailed enough for municipal planners and technicians (an issue which relates to the spatial scale). Temporal elements are relevant in that the tool portrayed CC impacts for the mid and late century, which are outside the planning timeframes of local decision-makers (see Section 1.4.1). This being said, due to the fact that municipal sectors were involved in the development of the tool, valuable capacity building occurred as they engaged with the complexities of CC impact studies (Golder Associates, 2010). Municipal capacity in this arena has thus increased and has led to EM officials participating in an integrated assessment modelling process at the national level (Roberts & O'Donoghue, 2013). The Integrated Assessment Tool is now being taken forward by a municipal/university partnership between EM and the University of KwaZulu-Natal, which is likely to further enhance the learnings and progress in relation to the science-practice interface. EM 4 spoke about how this partnership, was initially difficult to coordinate as research foci and timeframes worked under, differ between municipal officials and academics/researchers.

[41] ICLEI's 2012 World Congress and the learning forum: 50 CC Partnerships by 2015 (8 - 10 October 2012).
[42] It assessed the impacts of temperature, rainfall, storm activity and sea-level rise on human health, agriculture and vegetation in the EM area.

The Sea Level Rise Tool (a component of the Integrated Assessment Tool) has received a more positive response from city planners. The tool visually represents three sea-level rise scenarios (300 mm, 600 mm and 1000 mm by 2100) along the EM coastline, and is being used by planners to visualise and plan for potential sea level rise impacts (Roberts & O'Donoghue, 2013). Interestingly, due to the expertise of a CC champion in the water sector of EM, this tool was developed in-house, whereas in Cartagena (Columbia) a municipal/researcher partnership enabled their sea level rise assessment (Gogoi et al., 2014).

The difficulty in applying scientific CC impact information was discovered by Mukheibir et al. (2013) in their study on multi-scale barriers to CCA within Australian local government. They called this barrier *"uncertainty of, and limits to, information and knowledge"* (Mukheibir et al., 2013, p. 40), and discussed issues such as: (a) lack of coordination and communication of CC information; (b) perceived lack of CC information that is relevant at the local-level; (c) challenges in understanding CC science; and (d) poor communication between local government and researchers (see Section 8.7.1.2). Bahadur and Tanner (2014) discuss the disjuncture between producers and users of CC information. They indicate that the producers of CC information operate within an environment where foresight, flexibility and planning within the parameters of uncertainties is necessary. By contrast, the users of CC information, operate in policy environments that are centralised, and where command and control strategies are used for the achievement of short-term goals, and the preservation of the status quo, manageable steady states and predictability (Bahadur and Tanner, 2014). There is clearly a disjuncture, which relates to issues of operational realities, values and worldviews. Perhaps the solution lies not just in producing more precise science, but in developing ways and means to overcome these social barriers. One of the ways that this can be done is via the co-production of knowledge, where a spider web (as opposed to a bridge) of knowledge exchanges are developed between multiple stakeholders (both producers and users of knowledge) (Vogel et al., 2007).

6.6.1.3. Limited communication and engagement

Knowledge and communication barriers that manifested at the community level related to community members involved in the BCRP not being aware of where their tree saplings were going, and not understanding the broader rationale of the project (Greater Capital, 2011, see Section 6.5.1.4), which contrasts with EM 5's assertion that:

> *if you go and ask any 'treepreneur' in Buffelsdraai/Osindisweni, who's been involved for two years or more, I think you'd be amazed at the depth of their understanding around CC issues. I think they have a very good sense of where their trees are going and quite a strong sense of pride around that…*

To date, the BCRP has focused more on targets related to the number of trees planted, carbon sequestered, tangible community benefits provided, and biodiversity improvements achieved; as opposed to the education and intellectual empowerment of community members, which is more difficult to monitor and evaluate (see Section 6.5.1.4). The BCRP has occurred organically, where skilled staff members with a passion for CC and biodiversity utilised a window of opportunity (hosting the 2010 FIFA™ Soccer World Cup) to drive the project. Achieving targets has assisted in garnering funds and buy-in for the project, which has meant that community participation has had less of a focus. In an attempt to overcome these challenges, both EM 1 and EM 5 indicated that the recently awarded grant from the SA Green Fund[43] will be used to educate and train community members. EM 1 said *"quite a focused education programme that will engage with those communities on a weekly basis around CC and bring in the reforestation aspects"*. Accordingly, in May 2014, a tender was issued for an environmental/CC education campaign, for educating community members about the key objectives of the BCRP, and assisting community members in starting small businesses. The importance of community education was expressed by EM 1:

> *I think the seeds that we sow today, in terms of educating people around the importance of these forests, and the importance of the ecosystems services that they derive, that's going to pay off big time in the future. I think that's one of the biggest short-falls at the moment, is that we don't do that, we don't have a dedicated education programme. We don't have people that are out there working with the community teaching them this stuff. I think we're missing one of the biggest opportunities, you know, we've got 600 tree-preneurs out there growing trees and literally all we're doing is buying trees from them… We're not actively engaging and teaching them: this is where the benefits are. It's just not going to filter into those communities and down the line we're not going to get the support when we need to protect the forest and look after it… I don't think the reforestation programmes are really going to be sustainable, to be functional or successful if we don't get proper buy-in from communities and educate them…*

Discussion on awareness raising of community members came to the fore in the feedback session. Many of the participants indicated that more should be done to educate community members involved in the BCRP, while others indicated that the lesser focus on community education has not hindered the impact of the project. EM 5 said:

> *There are many organisations that would not have done any of the rest, but would have just started with the education/awareness, local community understanding, and to this day they would still be battling in that space. It's not a black and white space, that if you don't do the*

[43] See: http://www.sagreenfund.org.za

awareness you won't achieve things. Sometimes you have to be pragmatic; government funds person-days, how relevant did it make us to COP17, or to the World Cup…

In the feedback session EM 21 indicated that even if extensive community education was enacted (leading to communities understanding the value of the forest), if the forest was able to provide immediate socio-economic benefits, community members would not hesitate in exploiting them. EM 21 said: *"if they don't have a job, and they are cold, they will burn the tree…"* The longevity and sustainability of the BCRP therefore in EM 21's opinion, is not just linked to the community valuing the ecosystem and CC benefits of the forest (enabled by education), but also whether they are receiving socio-economic benefits from the project, in the present.

Developing country municipalities have limited resources, and therefore have to prioritise where money and time is spent. It is often a better use of scarce resources to educate community and government leaders, who may inspire others, as opposed to more general educational/awareness raising. The focus of educational initiatives also depends on the aspirations and goals of the project; Bahadur and Tanner (2014) indicate that if the aim is to achieve transformational resilience, than CC awareness among residents, increasing their 'conscientisation' and thus their power (Pelling, 2011), is essential. Up-skilling of non-scientists (in this case community members) increases their adaptive capacity (Vogel et al., 2007), and improving community adaptive capacity is vital to the achievement of CCA and CBA. Only when community members understand the risks they face and are capacitated to engage in political processes and access the resources needed to adapt, can they be seen as resilient to CC (Adger, 2013). This kind of empowering education requires meaningful community engagement, which addresses power imbalances and enables a two-way flow of information between the operator and receptor of CCA and/or CBA (see Section 3.3.2) (Gogoi et al., 2014). Achieving this level of participation is vital in supporting autonomous adaptation. In many ways, community-led adaptation will only occur when the community feels empowered to do so, which will require access to knowledge, resources and networks, and the confidence and ability to use them. This kind of empowerment is unlikely to occur if projects are run in a top-down way, where existing power relations are endorsed, and may even contribute to community dependence on government interventions. To achieve community empowerment, Gogoi et al. (2014) indicate that adaptation interventions should begin with community considerations, which involves understanding how they are innovating, and what the barriers are to the experimentation and up-take of new ideas. To truly empower community members, requires not just ensuring that they receive benefits (related to distributive justice), but also consideration of the process of how community members receive these benefits (procedural justice) (see Section 1.4.3). Fair outcomes and fair process is required for fair adaptation (Adger, 2013).

A real on-the-ground challenge related to these issues is how the project team will be able to exit the area, which requires breaking the communities' reliance on the project's socio-economic benefits (discussed in Section 6.5.1.4), while ensuring the integrity of the forest for at least 20 years (to achieve the carbon sequestration goals), which will require buy-in from the adjacent community. Most feedback session participants felt that the forest would be able to be maintained as the municipality owns and controls the land, allowing tight policing. EM 23 stressed the fact that maintaining good relations with the adjacent community is vital, as the land is contested. He indicated that the community is already entering the forest site (which is not fenced) to engage in hunting, negatively affecting biodiversity. According to him, the question of who owns the land and who gains benefits from it is essential, he said: "*long-term land ownership perception to me is vital; the traditional, versus the community, versus the municipal, versus the departmental…"* Hence, questions remain as to who the BCRP should benefit and to what extent, in both the short and long term. Should the adjacent community's needs be prioritised over the needs of the wider community? Should socio-economic, educational/research, ecosystem service or carbon sequestration benefits be prioritised? These questions are likely to be answered by analysing the intrinsic aims of the project, which are unlikely to be uniformly held by all the stakeholders involved (revealed during the feedback session). The prioritisation of the BCRP's multiple goals will be reflective of who holds the decision making power, making the future of the project interesting to follow.

6.6.2. Human resource barriers

EM has been able to attract highly qualified and skilled staff, but lack of skilled staff was still an issue for some interviewees[44]; EM 1 said: *"lack of staff, um, it's been a major issue, not only for our branch, but for climate, getting the right people in, losing key staff…"* EM 3 described human resource challenges as the biggest barrier to his work, and discussed the gap between the types of skills university students and consultants have, and what is needed by his department:

> *People is probably the biggest, human resources, and that problem is quite a big problem. It's not just getting people; it's also the institutional structure of getting those people, writing the job description and then getting the right people because the skills in this space don't really exist in this city. So there is a problem in the tertiary institution environment, they are not spitting out people that we can employ locally… So there's that skills gap, and that skills gap also manifests itself in the private sector, what we find with consultants is that they are also not that clued up about this stuff either, so there's just this kind of lack of skills generally, so it's people, physical bums in seats in the office, but also just general skills…*

[44] The code 'lack of skilled staff to deal with CC' received 21 references in the semi-structured interviews.

Throughout the interviews with staff in management positions, 'people-power' was discussed as a major barrier, but also an enabler of the CC work (Section 6.8.1), as with the right human resources many other barriers can be unlocked.

During the feed-back session, EM 15 questioned whether enough is being done to develop secondary champions to take the CC work forward, as key champions may not be around forever. Mentorship and transference of institutional knowledge is essential in large organisations such as EM. EM 26 indicated that the Environmental Planning and Climate Protection Department is now making a conscious effort to put more faces to the CCA agenda, both to ensure capacitation of secondary champions and also to portray different CCA faces to both internal and external stakeholders; thus avoiding the association of the municipality's CCA work with specific personalities as opposed to the municipality as a whole. The strength and drive of strong individuals has been essential to the initiation and development of the CCA work stream (Section 6.8.1), but can hinder collaboration if these strong personalities do not work well with certain stakeholders.

6.6.3. Financial barriers

The main theme discussed in relation to financial barriers related to the difficulty in procuring service providers and accessing funds via the municipality's procurement system[45]. This barrier was also coded as an organisational barrier and is discussed in Section 6.5.1.1. Interviewees also spoke about the lack of adaptation funds in general (e.g. funds stimulated by international climate negotiation agreements), the lack of CCA finance for other developing country municipalities, and how organisations involved in the Durban CC Partnership were unable to contribute to the partnership financially (see Section 6.5.2.2). Lack of funding received limited attention[46]; this is likely due to the fact that EM, as compared to other South African municipalities, is relatively well resourced in terms of finance for CC work. It has benefitted from both international funding (e.g. from DANIDA and the Rockefeller Foundation) and internal municipal funding; indicating municipal buy-in for the CC work. International funding has been useful as funding conditions have not been overly stringent, allowing the freedom needed for EM to conduct learning-by-doing (Section 6.8.2 and discussed by Carmin, Anguelovski, & Roberts, 2012, p. 23).

[45] Coded as 'procurement system hinders financial flow', which received 14 references in the semi-structured interviews.

[46] There were only seven references to a lack of funds in the semi-structured interviews (coded as 'not enough money available for CC').

6.7. CONTEXTUAL BARRIERS

Contextual barriers were mainly discussed by those working at the community level or the community members involved in the BCRP, and in response to questions relating to their concerns for their community and whether they had noticed changes in the weather. The issues discussed are summarised in Table 6.2 according to the themes outlined in Section 5.2.

Table 6.2. Issues discussed by interviewees in relation to contextual barriers

Theme	Points discussed
Vulnerability under existing climatic conditions[47]	• Too much rain in winter. • Too much rain in summer. • People won't move if affected by extreme events. • People's homes collapsing during floods. • Wind blowing roofs off homes. • Colder than normal in winter. • Heat exhaustion experienced by those digging holes and planting trees as part of the BCRP. • Lack of water affecting planting of BCRP trees. • Lack of water affecting 'treepreneurs' ability to propagate trees.
Vulnerability under existing socio-economic conditions[48]	• Crime. • Health issues, diseases and lack of health care. • Unemployment and high dependency on elderly (for social grants, e.g. pensions). • Youth issues: dropping out of school, not receiving tertiary education, and unemployment. • Alcohol and drug abuse.

6.8. ENABLERS

6.8.1. Engaged officials

EM's greatest asset in relation to the leading CCA work that has been planned and implemented, relates to exceptional human resources[49]. The vital role that these highly skilled individuals play can be seen throughout the enablers discussed in this section. Gogoi et al. (2014) indicated that most documented CBA pilots report on the catalytic role that 'expert' actors (in their case mainly NGO, research institute or international agency actors) play in their initiation. Connecting vulnerable communities to these 'expert' actors is essential, as they have access to resources, technical support and information that can build upon indigenous knowledge and autonomous innovations (Gogoi et al., 2014).

[47] Received 10 references in the semi-structured interviews.
[48] Received 12 references in the semi-structured interviews.
[49] The code 'skilled, passionate, driven human resources' received 23 references in the semi-structured interviews.

6.8.2. Learning-by-doing

EM 2 indicated that no other department in EM was tackling CC when the Environmental Planning and Climate Protection Department initiated the Municipal Climate Protection Programme, which allowed flexibility in how CC was tackled without the stringent regulations which are placed on more business-as-usual municipal functions. The 'newness' of the CC field within the municipal arena, allowed EM to have an initial and strong focus on adaptation as opposed to mitigation; CCA aligned more readily with the Environmental Planning and Climate Protection Department's biodiversity function and skill-set. The CCA work was thus embarked upon via learning-by-doing, implementing projects when financial and human resources became available, and then developing more concrete policies and plans based on this experience. The opportunism, enabled by this learning-by-doing approach, assisted in overcoming lack of municipal *"interest, leadership, institutional support and resources for climate protection planning"* (Roberts & O'Donoghue, 2013, p. 306), as well as avoiding organisational and discursive barriers (discussed in Section 6.5.1) that could have stopped any CCA from occurring. An example of this learning-by-doing approach (described as an opportunity [understood as an enabler in this thesis] for CCA by Klein et al. [2014]), is that the Durban CC Strategy (Section 6.3.8) was developed ten years after the Municipal Climate Protection Programme was initiated, contrasting Measham et al.'s (2011) assertion that integration of CC normally begins with strategic planning, as only once CCA is accepted by the political structures will adaptation be integrated into on-the-ground planning.

6.8.3. Partnerships and networks

6.8.3.1. International networks

Partnerships and networks[50] have been essential to EM's CCA work to date, and have been enabled by the cross-cutting enabler of engaged officials (Section 6.8.1), who are able to develop these connections. It is these networks that allowed EM 2 to travel overseas prior to 2004 to engage with CC science and led to EM 2's recognition of the significant impact that CC will have on cities, inspiring the initiation of the Municipal Climate Protection Programme (Section 6.3.1). These networks stimulated another enabler; capacity development of municipal officials, which is essential when bringing complex issues (such as CC) into local governance institutions (Roberts & O'Donoghue, 2013).

The strong international and national networks that staff within the Environmental Planning and Climate Protection Planning Department have, has assisted in gaining significant funding (Section 6.8.4), overcoming financial barriers, as well as allowing lessons to be learnt from global CC leaders,

[50] The code 'partnerships' received 19 references, and the code 'informal networks' received 8 references in the semi-structured interviews.

overcoming knowledge barriers. For example, EM is one of two African cities chosen to be part of the 100 Resilient Cities Centennial Challenge, which aims to *"enable 100 cities to better address the increasing shocks and stresses of the 21st century"* (Rockefeller Foundation, 2014, p. 1). To do this the Rockefeller Foundation provides technical support and resources to improve the urban resilience of the chosen cities from 2013 to 2016 (Rockefeller Foundation, 2014). EM staff also attend a plethora of national and international conferences each year, where they learn from best practice, and share EM's CC successes and failures, profiling the municipality as a CC leader, which further strengthens EM's ability to attract financial and human resources (also discussed by Carmin et al., 2012).

6.8.3.2. Inter-departmental collaboration

Networks exist across EM departments[51] in relation to the CC work. EM's environment and CC functions are embedded throughout the different municipal sectors, which is useful as those responsible for the environment and CC functions have been effective in tailoring the environment and CC agendas to the sector's context. The development of the Municipal Adaptation Plans (Section 6.3.4), driven by the Environmental Planning and Climate Protection Department, has led to inter-departmental collaboration across municipal siloes (often seen as a constraint to the coordination needed for adaptation [Ziervogel & Parnell, 2014]), between sector-specific champions[52]. The sector specific approach of the Municipal Adaptation Plans counters Critchley and Scott's (2005 as cited in Measham et al., 2011) assertion that CC plans, like the concept of CC, must be cross-sectoral. The approach adopted in EM was dubbed the 'ripple model' by Roberts and O'Donoghue (2013), who explain that if enough 'pebbles' (CC champions) are dropped into a pond, their ripples (or influence) will eventually overlap. One example of these ripples overlapping has been the development of the uMhlangane River Catchment Project, where a cross-sectoral team works to improve the Catchment's functioning. Funding for the project has been derived from Germany's BMZ (Federal Ministry for Economic Cooperation and Development), with supplementary funding from the City of Bremen (a sister city of Durban's) and EM (EM, 2013), thus highlighting the importance of international funding in enabling pioneering work such as this (Section 6.8.4).

The inter-departmental collaboration that the Municipal Adaptation Plan process has enabled, has not come without costs though, and has required a significant investment of Environmental Planning and Climate Protection Department staff's time in developing relationships with identified sectoral champions (reiterating the importance of engaged officials, Section 6.8.1). Time was invested in building trust with these sector champions, and gaining an in-depth understanding of their day to day

[51] The code 'inter-departmental collaboration' received 7 references in the semi-structured interviews.
[52] Identified and capacitated through the development of the plans.

activities, which allowed CC information to be tailored to the sector; increasing understanding and buy-in. Building these relationships and thus mutual understanding has been advocated as a way to overcome barriers to the communication and use of CC information, as only when information is offered in ways that can be integrated into decision-making processes will it be taken up by practitioners (Vogel et al., 2007). Like EM's approach to the Municipal Adaptation Plans, Vogel et al. (2007) suggest that for science to be integrated into policy, an understanding needs to be gained of what practitioners do, as opposed to what information they need.

Inter-departmental coordination between Durban Solid Waste and the Environmental Planning and Climate Protection Department has been essential to the establishment and running of the BCRP. Durban Solid Waste, like the Environmental Planning and Climate Protection Department, is an innovative municipal department, which manages the city's world-class landfill sites.[53] Durban Solid Waste's endorsement of the BCRP has allowed the landfill site's buffer zone to be used for reforestation. Their control of the site also ensures that the forest is secure, and water is provided for the BCRP trees from their leachate purification plant. This partnership has also introduced the BCRP team to a restoration specialist who's: (a) extensive knowledge and experience in building forests; (b) skill in dealing with Durban Solid Waste requirements in relation to the landfill buffer zone; (c) proficiency in dealing with the on-site farmers; and (d) competence in training community participants, has been invaluable to the project.

The importance of inter-departmental collaboration to the implementation of the BCRP should not be downplayed. The Environmental Planning and Climate Protection Department is located in the planning unit of the municipality, and hence benefits from collaborations with other municipal departments, like Durban Solid Waste, when implementing projects on-the-ground. Another example is how collaboration between the Environmental Planning and Climate Protection Department and the Architecture Department has enabled the further roll out of the Green Roof Pilot Project (Roberts & O'Donoghue, 2013).

6.8.3.3. The municipality/NGO partnership and its value to the BCRP

Interviewees indicated that the EM and Wildlands partnership has been particularly important in enabling the BCRP[54]. EM was able to source the location for the reforestation project, garner significant international and municipal funds for the project, and bring a team of skilled managers to the table. Wildlands has brought an innovative, creative and skilled team (working outside the municipal structure) to the table, as well as a working model (see Figure 6.3) for the project. This

[53] Durban Solid Waste has initiated a number of large landfill gas to electricity projects and established nature conservancies within its landfill and buffer zone precincts.

[54] The code 'NGO and municipal partnership' received 9 references in the semi-structured interviews.

municipal/NGO partnership has assisted in: (a) overcoming municipal human resource shortages which hinder fine-scale community work (Section 6.5.1.3); (b) allowing innovation within the limits of the top-down municipal approach (Section 6.5.1.3); and (c) overcoming the lack of mechanism for local government to engage with communities (expressed by EM 2). In relation to this partnership, EM 1 said:

> *So bringing in an implementing agent… they're innovative, they're creative… and I think very committed to what they're trying to do. What was also beneficial, was that they already had a model that they could bring to the table… was already tried and tested… so to my mind, we were able to achieve a massive amount because of that…*

The role that partnerships play in enabling CBA was also clear in the systematic literature review, where most of the papers analysed involved the implementation of CBA by government/NGO/community partnerships (see Section 4.3.2.3). In Western Kenya, the community based organisation, Uhai Lake Forum, has through strong partner relations, been able to build funding bridges between national entities and local communities (Fukuoka et al., 2014).

6.8.4. The ability to garner external funding

Funding from external organisations[55] has been an important enabler of EM's CC work to date, which has been facilitated by engaged officials (Section 6.8.1) and the networks and partnerships they have established (Section 6.8.2). DANIDA, the Rockefeller Foundation and Germany's BMZ, are amongst the organisations that have invested in EM's CCA work. However, it must be noted that utilising the municipality's biodiversity budget was also an important enabler of the initial CC work (Roberts and O'Donoghue, 2013). Once the Environmental Planning and Climate Protection Department could prove that CCA programmes and projects worked and had socio-economic benefits, it could motivate for specific municipal CCA funding, initially to fund a portion of these projects. The 2010/2011 financial year was the first year that the municipality dedicated funding directly to CC work (Roberts & O'Donoghue, 2013). Once on the municipal budget it became easier for projects to become fully funded by the municipality, which is now the case for the BCRP. National funding has also recently become significant, when EM received a large grant from the SA Green Fund.

The ability to attain funds is contributed to by: (a) EM having a good reputation[56] for the successful implementation of CCA projects; (b) the formal and informal networks that municipal staff have developed (Section 6.8.3); (c) the strong proposal writing skills that Environmental Planning and Climate Protection Department staff have; and (c) EM's good credit rating and financial management

[55] The code 'funding from external organisations' received 13 references in the semi-structured interviews.
[56] The code 'a good reputation' received 6 references in the semi-structured interviews.

reputation. However, this enabler could be seen as a barrier for smaller or less well known municipalities (see Section 9.5.2). In these municipalities, external funding to the extent of that which EM has received would be transformative, but these municipalities may not have the reputation, credit rating and/or skilled staff needed to attain and manage this money effectively.

The Energy Office, which was initiated via seed funding from DANIDA[57] (EM, 2014d), has also gained significant international funding for its energy and mitigation work. This combined with the fact that it saves the municipality money via its energy efficiency initiatives, and that SA has faced energy shortages over the past seven years, has meant that the energy/mitigation work has gone relatively unopposed. This being said, support for this work may dwindle when new national power plants come online and demand side management is less of an issue in SA, which alludes to a rather counter-productive system for CC mitigation in SA, where municipalities gain revenue from the sale of electricity (see Sections 8.9.1 and 9.5.1).

6.8.5. Supportive leadership

Despite the CC mandate for municipalities not being clear (see Section 2.2.2) and CC being outside of the knowledge base of many high level municipal officials and politicians, high-level leadership and buy-in for CC work in EM has been significant[58]. This buy-in has been garnered because EM has pioneered globally recognised projects, won numerous awards, developed a strong CC reputation on both the national and international stage, and deployed its skilled staff in lobbying high-level municipal decision-makers. The priority that CC receives in the municipality is represented by its extensive integration into the Integrated Development Plan (see Section 6.3.9), and it being tied to budget via the Service Delivery and Budget Implementation Plan. Another reason for EM's high-level buy-in for CC, is that the Environmental Planning and Climate Protection Department has been successful in communicating a context-specific CC story to high-level decision makers. As Ziervogel and Parnell (2014, p. 60) put it, they have been able to place adaptation within the *"complex political and institutional landscape".* An example of such communication comes from EM's Integrated Development Plan, where CC is linked to development, which is central to local government's mandate (EM, 2014a, p. 91):

> *CC runs the risk of undoing all of the development gains of the last one and a half decades, and for a city such as Durban CCA in all sectors will have to become one of the Municipality's top development priorities with the appropriate planning for CC impacts pervading throughout all municipal sectors.*

[57] Through the Urban Environmental Management Program (EM, 2014d).
[58] The code 'leadership: high level buy in and will' received 9 references in the semi-structured interviews.

6.8.6. Promoting projects with ancillary benefits

The BCRP is premised on the principle that projects that provide social, economic and ecological benefits present no regrets options for local level implementation. Hence, an important enabler specific to the BCRP has been the fact that the project has multiple benefits[59]. Not only does it aim to tackle both CCA and mitigation, but there are also numerous ecosystem service and socio-economic benefits. Of particular importance to the community members interviewed were the socio-economic benefits of the project. EM 6 stated in relation to these benefits: *"that's their main interest for them to get to be involved, because they realised there is a benefit"* (also discussed in Section 7.8.1). During project initiation, take-up was slow as community members battled to link trees to material goods, but as the project progressed and community pioneers (who got involved in the project at the early stages, despite community scepticism) began to accrue benefits (e.g. employment, groceries, building materials, school fees), more and more community members decided to join the project.

To a large extent it is the socio-economic benefits that have entrenched the community buy-in and motivation for the project, but have also created many challenges (see Section 6.5.1.4); which brings to the fore dimensions of social justice, as it is the process (procedural justice), not the outcomes (distributive justice) that have presented significant challenges. This being said, it would be interesting to investigate if the BCRP has increased social capital and community cohesion, which are important enablers of adaptive capacity and CBA (see Adger, 2003). The project has: (a) given unemployed community members something to be involved in; (b) linked community members together via project networks; and (c) identified community pioneers/leaders; all of which is likely to contribute to community cohesion. There may be an opportunity for these community networks to be used for CBA or community development interventions in the future, which would further enhance community cohesion and adaptive capacity.

6.8.7. Taking advantage of windows of opportunity

Another significant enabler of CCA work in the EM context has been the ability to take advantage of windows of opportunity, such as hosting big events, which "*build champions and get political buy-in"* (EM 4). One of these opportunities related to EM hosting a leg of the 2010 FIFA™ Soccer World Cup (Section 6.3.3). The Environmental Planning and Climate Protection Department used this opportunity to develop a set of green guidelines, which can be used to host 'greener' events in the city and encourage 'greener' development. A 'Guideline for Designing Green Roof Habitats' was also produced as part of the World Cup's green guidelines, as a means of documenting the project's lessons to date

[59] The code 'projects with multiple benefits' received 24 references in the semi-structured interviews.

and inspiring others to plant their own green roofs (see Section 6.3.3 and van Niekerk, Greenstone, & ickman, 2011).

EM won the right to host COP17 in 2011 (Section 6.3.3), which provided the municipality with an opportunity to further entrench its reputation as a leader in the CC field. The newly elected Mayor as well as other politicians and administrators in the municipality had to improve their CC knowledge as the rest of the world converged on Durban for the 2011 CC talks. COP17 itself, the various conferences organised in and around the city and the field visits to EM's major adaptation and mitigation projects (including the BCRP), played an important role in informing a diverse set of stakeholders (including EM residents, politicians and administrators) about CC and what EM is doing to tackle it. At COP17, the BCRP also received important exposure as it was awarded the UNFCCC's Momentum for Change Award. These awards aim to showcase projects that are making a difference in their communities by implementing pioneering mitigation and adaptation interventions that have the potential for replication (UNFCCC, 2011). This award endorsed EM's role as a CC leader and inspired further high-level political and administrative support for its CC work (also aligned with Section 6.8.4). EM's Mayor now sits on the World Mayors Council on CC, various high-level committees within ICLEI's structures, is chair of the South African Local Government Association's CC Champions Committee, and is leader of the Durban Adaptation Charter. All of which is indicative of high-level buy-in for CC, which relates to Section 6.8.5: 'supportive leadership'.

6.8.8. Perceiving CC impacts

Perceiving the impacts of CC[60] is an important enabler of stakeholders understanding and prioritising CC. Municipal interviewees indicated that they thought significant action would occur if and when major CC impacts were experienced, as high-level decision makers would then circumvent bureaucratic hurdles that hinder immediate actions to combat CC (see Section 6.5.1). EM 1 said *"every big storm that comes along now, is going to be an opportunity to pump this idea that CC is here"*, and argued that documenting lessons learnt in the EM CC journey are essential, so that when CC impacts are more apparent, the municipality has a knowledge base to access, for the enactment of experience-based best practice. Following this logic, the accumulation of knowledge and knowledge networks are an essential part of the overall CC solution (see Section 6.8.9). Further evidence of how the perception of CC impacts can lead to increased CC impetus, is how major coastal storms that were experienced in the EM area in 2007, causing flooding, coastal erosion and infrastructural damage, created heightened civic and political awareness of CC impacts, and provided credibility for EM's adaptation

[60] The code 'perceived experience of CC impacts' received 14 references in the semi-structured interviews. This code included statements related to the fact that more substantial CC actions would occur when impacts were more apparent, as well as community members expressing their perceptions of CC impacts.

work (Taylor, Cartwright, & Sutherland, 2014). Ziervogel and Parnell (2014) discussed how the Mayor of EM bought into the need to tackle CC when disasters in 2007 and 2008/9 impacted local communities significantly. In the community context though, perceiving CC impacts does not necessarily lead to CC-motivated actions. Despite interviewed community members expressing how they had noticed changes in the weather (see Table 6.2), they had not adjusted any of their practices to deal with these changes.

6.8.9. Building on existing knowledge

An important knowledge enabler was discussed by EM 1 during the feed-back session in relation to the fact that global awareness of the need to address CC juxtaposed by not knowing exactly what to do has led to EM receiving funding without significant restrictions/conditions, allowing the necessary learning-by-doing and reflexivity that is vital to CCA work. The Environmental Planning and Climate Protection Department has been able to use this funding effectively by drawing on existing knowledge and expertise in other fields related to CCA. EM 23 drew further attention to the enabler of existing knowledge, stating that there is 15 to 20 years of experience in fields such as ecosystem restoration, which can be drawn upon when implementing adaptation. The planning and application of wider development interventions have much to contribute towards understanding what has or has not worked (Gogoi et al., 2014). In relation to CBA work, disciplines such as Community Based Natural Resource Management and Community Based Disaster Risk Management have much to offer (Reid & Schipper, 2014, and see Section 11.3.4).

6.8.10. Using the right language

Interviewees and participants of the feed-back session highlighted the importance of using the right language[61], informed by existing knowledge, and taking culture and tradition into account when communicating about CC. In the EM area, communities believe in the *Inkanyamba*, a mythical creature that causes havoc via storms. EM 4 said in relation to this issue:

> *On one hand that's a challenge, you've got people and you're trying to talk about CC and they are thinking in a different framework completely, but on the other hand, if you understand that, how they are thinking and then use that thinking to put the message across… that aligns well with cultural beliefs...*

EM 5 discussed this enabler in relation to using events that people can relate to when communicating CC (e.g. a flooded river), as well as discussing the socio-economic impacts that CC will bring (e.g. giving

[61] This relates to the code 'good communication of the knowledge', which received 9 references in the semi-structured interviews.

CC impacts an economic or social well-being value). He indicated that using positive language relating to opportunities and leadership, as opposed to guilt and fear, is important as it appeals to human nature. He also motivated for allowing people to self-discover CC as opposed to being taught in a one-way dialogue. Vogel et al. (2007) advocate for communication where 'experts' and 'lay people' are equally involved in a conversation about challenging issues; understanding the problem and developing solutions together. This enabler is likely to be particularly important in enabling CBA, which requires that both 'expert' and indigenous knowledge contribute to CBA interventions (Section 2.4.4).

Using the right language to communicate CC, often means that those involved in implementing the work do not use the term CCA, as indicted by EM 5: *"most of us do not talk about CC, only in rooms like this, we go out and talk about other things"*. The need to use non-CC language in certain situations is because the term CC can often invoke feelings of fear and disengagement. CC is also often perceived as overwhelming, unfamiliar and difficult to understand. EM 23 said: "*that word CCA to 90% of the people that I know is just a scary word"*. In addition, the term CC often cannot be translated into other languages successfully: *"you find that some of the concepts or issues, like CC or conservation, do not exist in the Zulu vocab"* (EM 17) (a barrier also identified in the systematic literature review, see Section 4.3.3.2). Instead, to gain traction, respondents indicated that they use words familiar to the relevant stakeholder, although being aware themselves of the adaptation implications of the work. Mukheibir et al. (2013) indicated that using terms such as 'climate risk', 'extreme events' or 'hazards' instead of CCA, leads to avoidance of CC debates (e.g. what causes the phenomenon), scepticism and political sensitivity (particularly when allocating budget). They found that using these alternative terms assisted in incorporating CCA objectives into existing responsibilities, as a continuation of existing areas of work. It also opened up access to funding streams that may not have CCA as a funding criterion (Mukheibir et al., 2013).

6.8.11. Education, awareness-raising and training

Many of the interviewees and feedback session respondents indicated that they felt that CC awareness-raising, education and training[62] was essential to moving the CCA work forward. However there were differences in how they saw this happening (refer to Section 6.6.1.3). Interviewees and respondents indicated that the learning that had occurred via the BCRP, for municipal staff, Wildlands, as well as community members has been important, and should be built upon and expanded.

[62] The code 'awareness, education and training' received 21 references in the semi-structured interviews.

6.9. RELATING THE BARRIERS AND ENABLERS DISCOVERED TO CBA

All of the organisational and discursive barriers discussed in Section 6.5.1, in relation to EM's adaptation work and the BCRP, are likely to play out strongly if the municipality was to embark upon CBA as defined in the literature (see Section 2.4). The complicated nature of the municipal financial management system (Section 6.5.1.1) has been a challenge for the municipality's CCA work to date, despite the top-down nature with which these interventions have been planned and implemented, and hence is likely to be an even greater challenge for CBA (see Section 2.4.1). CBA, calls for the decentralisation of decision making, which would require overcoming the barrier of EM operating in a top-down fashion (Sections 6.5.1.3 and 6.5.1.4). Involving community members in decisions relating to interventions and how funds are spent, is not only difficult to envision occurring within the top-down operations of the municipality (Section 6.5.1.3 and 6.5.1.4) and due to issues of mistrust (Section 6.5.2.2), but also because this level of interaction will require skill sets not readily possessed by municipal staff (Section 6.6.2). To build these skills and implement decentralisation measures would require a significant municipal commitment, both in relation to shifting mindsets and in moving resources.

EM has been relatively successful in attracting highly skilled staff members and funds for its CC work, but these resources will likely be inadequate if true community empowerment, via CBA, was to become a core priority. The fine-scale interactions with community members that CBA calls for, where: (a) community knowledge and expertise is valued as highly as 'expert' science; and (b) community needs, values and expectations are taken into account, is a slow and arduous process. In fact, it is likely to require transformation in how EM does business, which due to the nested nature of governance in SA, would likely require changes in how government in general does business. The lack of inter-governmental collaboration discussed in Section 6.5.1.2, will likely hinder these cross-scale changes.

Resource barriers to CBA, do not just relate to the extensive human and financial resources needed to enable 'true CBA', but also relate to the knowledge and communication barriers discussed in Section 6.6.1. CBA, like CCA, is exceptionally complex, especially because it requires consideration of even finer scales than municipal level adaptation. Communities, particularly in SA, are not homogenous, and include multiple cultures, traditions, languages and religions, all of which influence how individuals engage with CC. This makes communication and engagement ever more complex. Community members also have different levels of access to resources, resulting in intra-community adaptive capacity differences (Eriksen & Brown, 2011), which complicates community adaptation interventions. It is obvious that issues relating to lack of accurate and user-friendly local-level CC projections is just as much a challenge for CBA as it is for CCA (se Section 4.3.3.2). The section (6.6.1.3)

dealing with lack of communication and engagement with community members, is directly related to CBA barriers, which relate to: (a) the top-down approach of the BCRP; and (b) the need for fine-scale community engagement to be prioritised by engaged officials, for it to be achieved (discussed below).

Another contributing barrier to municipal officials engaging in CBA is the perception of community apathy and lack of social cohesion (discussed in Section 6.5.1.3). A vulnerability assessment conducted in two communities within the EM area (Ntuzuma and Ntshongweni), found that there were high levels of disunity, mistrust and apathy in the communities; contributed to by a number of contextual issues, e.g. high crime rates, poor access to health services, high unemployment, reliance on government grants, and lack of education and skills (Golder Associates, 2011). The barriers of 'discounting the future' (Section 6.5.2.1) and 'mistrust' (Section 6.5.2.2) will also hinder CBA, which considers future CC impacts and relies on trust-based collaborations between stakeholders. These social barriers need to be overcome for CBA and the principles it embodies to be prioritised within EM's CCA work. Recommendations that came out of the vulnerability assessment (Section 6.3.5) for CBA were: (a) to build on existing community structures, such as community groups (Golder Associates, 2011); and (b) for those driving municipal adaptation to work with other municipal departments that engage at the community level (Golder Associates, 2011).

An important enabler in relation to taking these recommendations forward and/or building the municipality's CBA work are that engaged officials in the municipality do acknowledge the need for better community engagement in the CCA work (see EM 1 quote in Section 6.6.1.3), as well as the value of CBA. These engaged officials have attended a number of CBA learning events, and avenues that are being explored to take this work forward are: (a) bringing staff into the Environmental Planning and Climate Protection Department who have the necessary skills for CBA; (b) using funding for learning-by-doing in this new area of work; and (c) partnering with organisations skilled in community engagement. This is a positive sign for municipal planned CBA in EM, and indicates that perhaps EM may lead in yet another area: municipal enabled CBA.

CHAPTER 7: CHRIS HANI DISTRICT MUNICIPALITY

7.1. INTRODUCTION AND BACKGROUND TO THE CASE STUDY

Chris Hani District Municipality (CHDM) is the second case study where barriers and enablers to planned CCA and CBA are explored. It offers a useful comparison to the other cases, as it is a rural district municipality experiencing significant resource shortages but none-the-less is planning for CC and has implemented a successful programme, which increases the resilience of its communities to climatic changes.

Contextual information relevant to CHDM, which can be compared to the other three case studies, is housed in Table 7.1. CHDM includes eight local municipalities within its municipal jurisdiction (see Figure 7.1); four of which were previously part of the Transkei and Ciskei homeland areas of SA, and have a history of underdevelopment. The CHDM area consists of urban nodes of development, large commercial farms, and rural areas where people practice multiple livelihood strategies, including subsistence farming.

Table 7.1. Contextual information relevant to CHDM

Type of municipality	District
Main city/town(s) governed	Queenstown
Population size	795 462 (StatsSA, 2011)
Size of area under municipal jurisdiction	36 558 km^2 (CHDM, 2013), see Figure 7.1.
Rural/urban split	Predominantly rural (CHDM, 2014b)
Budget and economy	Annual budget of R 1 798 710 000 for the 2014/2015 financial year (CHDM, 2014c). The region's economy is dominated by the public sector, with high dependence on government social grants and remittances, especially amongst the poor (CHDM. 2014a).
Socio-economic challenges	• High poverty levels: 52.9% of the district live in poverty (CHDM, 2014b). • High unemployment: 39.66% (StatsSA, 2011). • Low levels of service delivery: 75% of residents do not have access to electricity and more than 75% of residents do not have access to a clean water supply (CHDM, 2014b). • High malnutrition and hunger index (CHDM, 2012).
CC projections (downscaling done for Queenstown, a town within the CHDM area [Coastal and Environmental Services, 2011])	• The average temperature is expected to increase by between 2 and 2.5°C by 2100, with an increased number of days exceeding 32°C (Coastal and Environmental Services, 2011). • Rainfall projections are less clear, with the majority of models predicting a slight increase in rainfall (Coastal and Environmental Services, 2011), although this may be negated in terms of water availability due to increased evaporation rates.

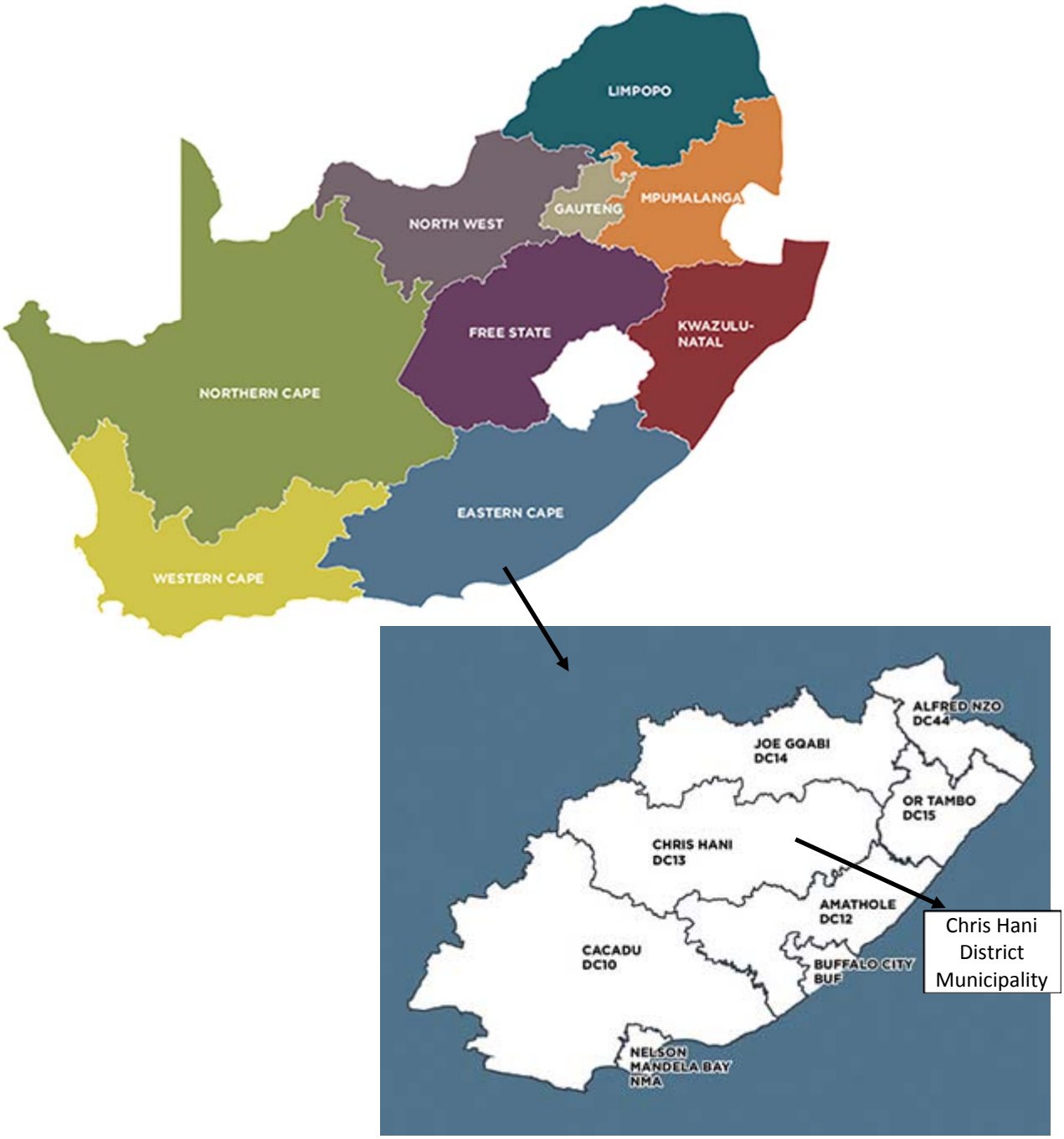

Figure 7.1. Map indicating CHDM's locality within SA (images from the Local Government Handbook, 2015)

7.2. SPECIFICS OF METHODS

Desktop research was conducted in relation to CHDM's CC work and the community-level programme being implemented, the Rural Sustainability Commons Programme (RSCP) (see Section 7.3.1). A pilot interview with CHDM 1 and 2 (see Table 5.3), as well as a field visit to the RSCP's flagship project at Three Crowns Primary School was conducted on the 14th of August 2012. Since then fairly regular contact has been kept with CHDM 1. On the 15th and 16th of January 2013 in-depth discussions were held with CHDM 1. The barriers and enablers garnered from the initial interview, informal discussions, site visit and analysis of the numerous publically available and internal documents, were discussed

with CHDM 1. Semi-structured interviews were also held with CHDM 3 and 4 (see Table 5.3). On the 5th and 6th of February 2013 a semi-structured interview was conducted with CHDM 2, as well as interviews with community members involved in the RSCP (see Table 5.3).

A feedback session was held on the 17th of June 2014 at the Environment and CC Forum (see Section 5.7), which is held every quarter in CHDM. Attendees at the meeting included one representative from the national Department of Environmental Affairs; seven provincial representatives from the Department of Economic Development, Environmental Affairs and Tourism; twelve representatives from CHDM; and five representatives of local municipalities within the Chris Hani district. On the 20th of August 2014 I shared the findings of my analysis, including the feed-back session, with an expert who has worked with CHDM on a number of CC-linked initiatives (see Table 5.5).

7.2.1. Methodological considerations

CHDM 1 provided me with a significant amount of his time and information that he had access to, and I provided, where possible, advice based on my previous local government experience. Significant portions of time were also spent with CHDM 2, as he took me out to the RSCP sites. He indicated that he had found it difficult to discuss the RSCP's shortcomings as he felt that I was evaluating or assessing the programme.

Interviews with the community members were conducted in English, as most of the interviewees were teachers and had a good command of the language. Conducting the interviews in my language of choice allowed me to interact more directly with the interviewees, without loss of information via translation. The only time that I felt that language was a barrier was when interviewing CHDM 7, as his grasp of English was less proficient than the other interviewees. The exact form of the interviews had to be adjusted based on the time that interviewees could give me. Hence group interviews were held at two of the schools where the RSCP had been implemented, as this led to less disturbance of the school's functioning. The group interviews were useful, as interviewees built on each other's answers and there was a general sense of openness and freedom to express one's opinion, probably due to good working relationships between the teachers. It was important in these meetings to create an atmosphere of sharing as mentioned by CHDM 2:

> *If we take today for example, you came to listen to the voice of the people, we didn't bring anything… and what you wanted to know was what do you think? What affects your life? A lot of stuff will come away from that… Not just to have a meeting with them and twist them around until they agreed to your objectives.*

It must also be noted that I could not have accessed the schools without the assistance of CHDM 2, who knew where the rural schools were and had the correct vehicle for accessing the schools. One has to take into consideration that perhaps the interviewee's positive responses in relation to the RSCP may have been related to me arriving with one of the main project implementers. This being said, a strong and open relationship seemed to exist between CHDM 2 and the community members, who openly discussed challenges and solutions with him post the interviews.

In relation to the feedback session, my presentation was placed at the end of the Environment and CC Forum programme (as opposed to the beginning, as was the case for the EM case study) and hence participants at the session may have been tired, as the meeting was in its fourth hour when I presented my findings. I had hoped to run the session, as I had in Durban, by going around the room to hear individual feed-back from each participant; this to encourage quiet individuals to share. The councillor chairing the session asked that I instead present my findings and then allow him to chair responses from the floor. His reasons being firstly that there were a large number of attendees (29, as opposed to 13 in the EM feedback session) and hearing from each one individually would take too long. Secondly, he preferred that we adhered to the way the forum is normally run; presentations being communicated in a one-way fashion and then questions or comments being requested by the chair of the forum. To overcome this challenge, ample time was given post my presentation for participants to raise any points and a useful discussion did proceed, albeit between the more expressive participants who were knowledgeable about CC. I approached most of the participants individually and in groups post my presentation (at lunch), to ensure that they had another (possibly less intimidating) opportunity to share their thoughts with me.

7.3. CONTEXTUALISING THE CASE STUDY: THE EVOLUTION OF CHDM'S CC POLICY AND PRACTICE

This section documents the evolution of CHDM's CC journey to date (derived from desktop analysis and interactions with interviewees), which has influenced and been influenced by the barriers and enablers, which are discussed in Sections 7.4 - 7.9. I summarise these milestones in Figure 7.2 and list them with brief descriptions in Sections 7.3.1 - 7.3.3. In Section 7.3.4 I consider CHDM's Integrated Development Plan, in relation to how it deals with CC. Due to severe human resource shortages (see section 7.6.2), lack of mandate for CC, and there being no organisational home for CC (see section 7.5.1.2), key engaged officials within CHDM (see section 7.8.2) have been vital to the evolution of the CC work that is documented in this section.

(a) 2010: Development of the prototype **Rural Sustainability Commons Programme** at Three Crowns Primary School.

(b) 2011:

- **CHDM Climate Change Response Framework** developed.
- High-level CHDM politicians and officials attend **COP17.**

(c) 2012:

- **CHDM CC Summit** held.
- **Environment and CC Forum** founded.

Figure 7.2. Timeline of selected CC milestones in CHDM

7.3.1. The Rural Sustainability Commons Programme

In 2007/2008 CHDM initiated a school greening and environmental health awareness programme, which involved implementing organic food gardens in numerous schools across the district. This programme had limited success due to the inability of CHDM staff to provide adequate support to the schools scattered across the large area of CHDM (see Table 7.1). Many schools were also not able to access the necessary water to maintain their gardens. Towards the end of 2008 the Wildlife and Environment Society of SA (WESSA), under the Eskom Energy and Sustainability Programme, implemented a small-scale energy project at Three Crowns Senior Primary School, where an organic food garden had been set up by the school's caretaker. Development Bank of Southern Africa (DBSA) funding was then ear-marked for a pilot biogas installation at the school. These three projects possessed synergies which could benefit the school and its surrounding community, and hence, the RSCP (Figure 7.2[a]), which combines the three project components: food garden, biogas installation and energy interventions, was founded (see Figure 7.3).

The RSCP has been installed at three schools in the CHDM area, and has received funds from the DBSA and CHDM, as well as human resource contributions from CHDM, WESSA and numerous consultants. The food garden, energy and education components of the programme were handled by CHDM and WESSA and the installation of the larger technology, such as the sanitation system, biogas digester system and waste water treatment facility were handled by consultants. Various other technologies have also been piloted at Three Crowns, including eco-circles, worm gardens, vertical gardens and solar cookers.

As the programme has been refined, the term sustainability commons has been unpacked. In this context it is understood to be *"a rich and diverse pool of sustainability-focused technologies, tools and learning; whose resources are deployed locally for the benefit of the community and environment"* (CHDM, 2011, p. 3). Challenges articulated in a funding application in 2011 include lack of: (a) human

resources for dedicated supervisors and mentors who can assist community champions in running the projects independently; (b) funding for completion of technology installations and for further roll-out; (c) a formal structure and administrative tools to run the programme effectively; and (d) cooperative governance (CHDM, 2011). These challenges represent human resource, financial and organisational barriers.

The RSCP would not be seen as a CCA initiative if one was to view adaptation as requiring that specific CC impacts are first modelled, and then understood and responded to (discussed further in Section 7.8.1). However the programme has been included as part of the municipality's CC response, as it improves community resilience to climate variability and change, by increasing community access to water, food, electricity and improved sanitation facilities. As is discussed in Section 2.3.1, CCA actions occur on a continuum, and this intervention is focused on development and addressing the drivers of vulnerability, as opposed to responding to specific CC impacts (McGray et al., 2007). Hence, the RSCP can be seen to align with building generic as opposed to specific capacity (see Eakin et al. [2014] and Section 2.3.2.1).

Figure 7.3. The RSCP's process

7.3.2. The CC Response Framework

A more strategic CC intervention involved the development of CHDM's CC Response Framework (Coastal and Environmental Services, 2011), produced in February 2011 (Figure 7.2[b]). In the framework document, the scientific basis of CC is explained, and the potential CC impacts for the Eastern Cape and the CHDM listed. As part of the framework process, specialist reports were developed for key sectors in the municipality that will be affected by CC (i.e. biodiversity, water resources, renewable energy, as well as agriculture, food security and livelihoods). The framework was received and approved by CHDM's Council[63] and communicated to all relevant stakeholders at two workshops. Despite Council approval, only one of the framework's recommendations has been implemented: the founding of an Environment and CC Forum (see Section 7.3.3). This lack of action is indicative of CC not being prioritised, but may also be due to the fact that the report is rather difficult for municipal officials and politicians to engage with. The framework report is large (84 pages excluding the specialist reports), the terminology used is scientific and technical, and it deals with multiple sectors without any clear allocation of responsibility (aligns with EM's experience with the Headline Adaptation Strategy, Section 6.3.2). Finding the time and resources needed to understand, never-mind plan and implement CC interventions, based on a document like this, is exceedingly difficult for municipal officials operating within a severely resource-constrained environment.

7.3.3. COP17, the CHDM CC Summit and the Environment and CC Forum

Towards the end of 2011, CC awareness in SA received a significant boost when SA hosted COP17, with many municipal politicians and officials (including representatives from the CHDM) from across the country having the opportunity to attend COP17(Figure 7.2[b]). At this point the RSCP was already in existence and could be used as a flagship project for CHDM, as CC issues rose up the agenda within all tiers of government. CHDM hosted a CC Summit post COP17 (Figure 7.2[c]) that was attended by national, provincial and local government officials, as well as private and public sector representatives. Two outcomes resulted from the summit: (a) A pledge was signed by CHDM and each of the local municipalities within its district, to enable CC work going forward. This pledge has unfortunately translated into little action beyond that led by CHDM. (b) The launch of the Environment and CC Forum (Figure 7.2[c]), the aim of which is to allow better collaboration between CHDM and its local and provincial counterparts with regards to environmental and CC issues. In his 2013 State of the District address, the Executive Mayor mentioned both the summit and the forum. He added that there was a

[63] The CHDM Council is the highest decision making body within the municipality and consists of 42 councillors who represent the district municipality and local municipalities within the district (CHDM, 2014b).

need to mainstream CC protocols into the delivery of services, via programmes such as the RSCP (Koyo, 2013). This high-level buy-in for CC is also reflected by the fact that CHDM's official website dedicates a section to showcasing its environmental and CC work (CHDM 2014b).

7.3.4. The Integrated Development Plan and CC

The association of CC with environmental issues is clear in CHDM's Integrated Development Plan (CHDM, 2014a); it being dealt with under sections such as environmental challenges and environmental management. The link between CC and water issues is also clearly articulated, with a section being dedicated to CC and drought mitigation (CHDM, 2014a). In this section, it is indicated that funding was received from the national Department of Water Affairs for drought relief measures, and that a CCA Strategy has been developed and was adopted by Council in the 2012/2013 financial year (CHDM, 2014a). This may be in reference to the CC Response Framework (see Section 7.3.2). Under the environmental challenges sections, the importance of environmental and CC issues is articulated: *"The greatest challenge facing government and local government in particular is how to minimise harmful environmental practises that contribute to global warming and ultimately CC"* (CHDM, 2014a, p. 128). The Integrated Development Plan also highlights issues such as lack of clean water, leading to personal and food hygiene problems, as well as farming difficulties, all of which contribute to health challenges in the district (CHDM, 2014a). The old and disabled are highlighted as particularly vulnerable to these issues, which is indicative of CHDM's concern for the most vulnerable (links to social justice, Section 1.4.3).

Under the CC sub-section within the section 'environmental management', the concept of CC is defined, its impacts elucidated, international efforts explained, and motivation made for the urgent need to adapt and mitigate this phenomenon. It is indicated that CC was prioritised by all departments at a district wide institutional strategic planning session in 2012, leading to a CC Summit (February 2012). The CC Summit resulted in three resolutions: (a) to develop a CCA Strategy for CHDM; (b) to continue involving stakeholders in the Environment and CC Forum (which focuses on issues such as CC education, training and awareness; environmental compliance, policy and legislation; biodiversity; as well as air quality and waste management); and (c) that the RSCP be rolled out to other villages, which will improve water conservation, food security, waste management, and reduce the impacts of CC in the district (CHDM, 2014a). CC is also discussed in relation to the disaster management and firefighting function of the municipality, which is expected to conduct a risk assessment (to inform a Disaster Management Plan) in the next financial year (CHDM, 2014a).

The seriousness with which CHDM takes issues of social justice, is reflected in the articulated prioritisation of poor communities, as well as the foundation of the Special Programmes Unit, which is a strategic unit that coordinates (across all municipal directorates) the municipalities endeavours to uplift designated groups (e.g. women, youth, disabled, children, elderly) and practice civic engagement (CHDM, 2014a). It could be hypothesized that a unit such as this, which is already established, may be a useful body to take on the CC mantel. This because CC is cross-sectoral, and the Special Programmes Unit is a cross-sectoral body, as well as the fact that the issues the unit deals with are strongly aligned with CCA.

7.4. KEY BARRIERS AND ENABLERS IDENTIFIED

The barriers and enablers experienced in CHDM relate to the understanding, planning and managing of CC within the municipal context. Despite significant barriers in understanding and planning CC, CHDM has implemented a useful community-level project: the RSCP (Section 7.3.1). Section 7.3 documents both understanding and planning interventions (Sections 7.3.2 - 7.3.4), and managing interventions (Section 7.3.1). The barriers and enablers related to these interventions, and those discovered during analysis of documents, interviews, and informal discussions, are reflected in Figure 7.4 and discussed in more detail in Sections 7.5 - 7.9. Like was the case in the EM case study, I found that: (a) barriers to CCA and CBA existed within all three of my framework's groupings, i.e. social, resource and contextual barriers; and (b) organisational and discursive, as well as cognitive and normative barriers often occurred together.

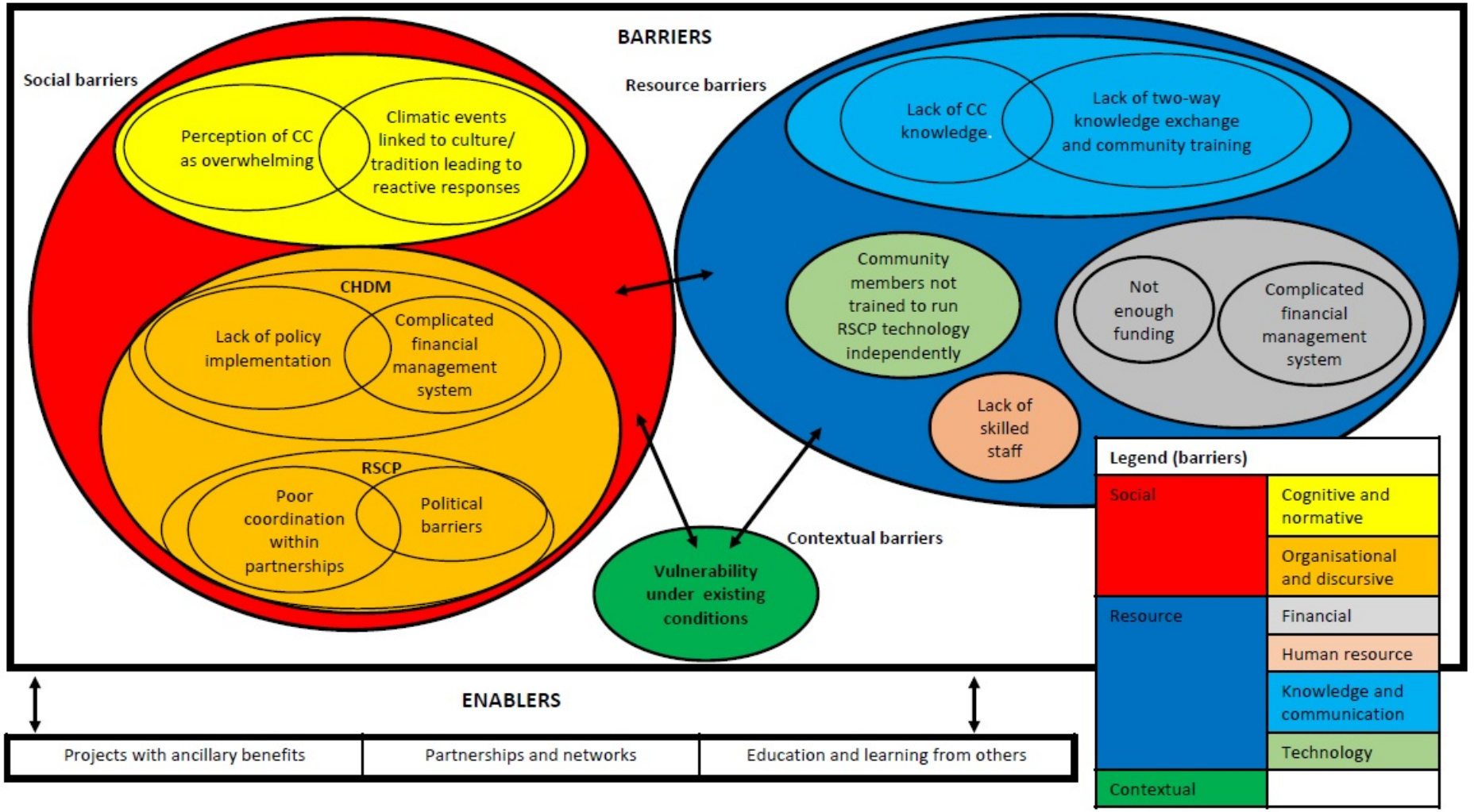

Figure 7.4. Overview of the barriers and enablers identified in CHDM

7.5. SOCIAL BARRIERS

7.5.1. Organisational and discursive barriers

As for EM, the organisational and discursive barriers identified can be separated into those relating to the municipality (Sections 7.5.1.1 and 7.5.1.2) and those relating to the planning, implementation and management of the RSCP (Sections 7.5.1.3 and 7.5.1.4).

7.5.1.1. CHDM: The complicated financial management system

The municipal procurement system[64] was cited as a major stumbling block to the RSCP, as indicated by CHDM 2: *"one of the big ball and chains is the slowness of the procurement system".* The financial management system made it difficult to utilise contractors that are specialists in the various components of the programme. CHDM 2 said that *"it becomes incredibly difficult to procure that, because you know, we want a quality of service and not just a service... who you deal with is as important as what you get."* One of the reasons for this difficulty is that the procurement system places high value on price (to save the municipality money), and specialists who have unique skills are unlikely to quote for work as the lowest bidder. A second issue, is that the financial management system discourages partnerships between the municipality and contractors for periods longer than three years (de Visser, 2012). Long-term partnerships are essential, especially in relation to a programme such as the RSCP, which requires specialist skills. The successful implementation of the RSCP relies on on-the-ground experience and good working relations (built up over time) between municipal staff, contractors and school staff.

A further barrier that was cited, related to significant delays in paying consultants and contractors and difficulties in procuring maintenance items which are needed quickly. CHDM 2 said that *"you can't wait six months for pipes, you must need pipes today and you must get the pipes... these are the issues that are hampering service delivery"*. Municipal officials battled to utilise the complicated financial management system to procure services effectively, especially because the RSCP required business-unusual use of the municipality's budget, e.g. procuring highly specialised (and expensive) services, and needing to procure small items on an ad hoc basis. A further constraint on the municipality's ability to procure the goods and services needed for the RSCP, related to human resource shortages (Section 7.6.2), as CHDM 2 indicated: *"if you had time to invest in addressing the procurement policy or process, it would be better, if you had time to plan around these things it would be better…"*

[64] The code 'procurement system hinders financial flow' received 10 references in the semi-structured interviews.

7.5.1.2. CHDM: Lack of policy implementation

Lack of policy implementation[65] was highlighted by interviewees as a major challenge in CHDM. The barriers that underlie this challenge relate to two issues, which are discussed below: (a) the municipality's adherence to a top-down approach (as discussed in Section 6.5.1.3); and (b) resource shortages (Section 7.6). The top-down, target-driven approach of CHDM (reflective of the CC discourses discussed in Section 2.2.3) leads to municipal officials being required to develop plans/policies that are then ticked off the list of tasks, often with limited monitoring of whether these plans are in fact implemented. CHDM 1 indicate that its *"just target driven again, I know I must develop a plan, so what, if the plan is developed, I get my 13th cheque or my bonus... Why must I spend half a million rand for a document that lies in a cupboard..."* Human resource barriers in CHDM have led to consultants being contracted to produce municipal plans, which are then handed over to the municipality with little budget allocated for consultants to assist the municipality in charting courses of action (this was discussed by CHDM 38). The fact that CHDM does not have a specific unit/department that deals with CC, exacerbates this issue, as there is no organisational home for the CC related work. The lack of a CC unit makes it a lot easier for CC plans/policies to fall by the way side when other issues arise (lack of accountability), especially (as is the case in CHDM) when the departments running the CC work have other mandated functions to perform.

Furthermore, it is difficult for target driven municipalities to consider CC, as they operate within timeframes inapplicable to CC (linked to yearly budget cycles, five yearly Integrated Development Plans and political terms of office), which requires long-term thinking and expenditure now for benefits later. CHDM 1 felt that barriers relating to CHDM's inability to tackle CC effectively under the present system of governance, could be overcome by national government intervention (relates to discussion on municipal mandate for CC, taken forward in Section 10.3.2): *"It's not Chris Hani must decide it, national government and SALGA* (South African Local Government Association) *must say this is our main targets nationally for CC… national sets targets… that's the only way you're going to force people at this level to take CC seriously."* Similar barriers were identified in the systematic literature review in relation to: (a) CBA not receiving funding due to more immediate concerns being prioritised (Section 4.3.3.2); and (b) lack of coordination between government departments, strategies and laws (Section 4.3.3.1).

[65] The code 'lack of policy implementation' received 9 references in the semi-structured interviews.

7.5.1.3. RSCP: Poor coordination within partnerships

Poor partnership coordination was discussed in relation to the RSCP[66], which came about organically when funding and human resources became available. Coordination difficulties occurred between various partners involved in the planning and implementation of the programme, as they adhered to different discourses, and had different goals for the RSCP (a barrier also identified in the systematic literature review, see Section 4.3.3.1). Due to the organic nature of the programme's inception, clear roles and responsibilities of the various partners were not discussed. Lack of coordination led to miscommunications and the eventual break-down in relationships; expressed by CHDM 1: "*If you name one of these consultants now I get red in my face. I was so angry with these guys, I don't want to work with them anymore…"* Lack of coordination and break-down in relationships was exacerbated by delayed payment of contractors (see Section 7.6.1), and different partners promising school participants in the RSCP different things (CHDM 1: *"then we sitting with trying to build bridges at the end of the day because this consultant promised x, y and z…"*)

The lack of coordination and clear roles and responsibilities, in combination with the innovativeness of the RSCP - with many of the partners implementing unique project components that could be patented - has led to certain ownership issues. Different project partners report on the project in different ways, in relation to who has funded, owns and leads the programme. CHDM 1 indicated that lack of communication has occurred when awards linked to the RSCP have been applied for and won, and when funding has been sought, making this barrier apparent to potential external funders. All of which has contributed further to the break-down of relationships between partners.

The worst manifestation of this lack of coordination was when projects within the RSCP were unable to be completed. The project implemented at CHDM 9's school was not completed, he said: *"the foundation phase was still battling because the CHDM did not finish the project, actually failed to fund it completely…"* He also indicated that many of the installed toilets no longer worked, which posed *"health risks to the learners, because my grade one learners, they are not using these toilets, as they are not complete, they just go outside, and they will just relieve themselves anywhere".* At his school, the biogas system had stopped working on numerous occasions, resulting in the school having to purchase liquefied petroleum gas. The economic benefit of the project was made clear when CHDM 9 indicated that without biogas they spend R 800 every two weeks on liquefied petroleum gas - equivalent to R 20 800 per year - a significant amount of money for a rural school. At this particular

[66] The code 'lack of coordination between project stakeholders' received 13 references in the semi-structured interviews.

school, the project's solar panel (on the office building) was also stolen, which is representative of contextual issues such as poverty, and potentially a lack of community buy-in and social cohesion.

Barriers relating to the coordination of partnerships/networks is not something unique to CHDM, Klein et al. (2014) indicate that these issues have been documented extensively in the literature; this issue was one of the main barriers to CBA that I discovered during the systematic literature review (see Section 4.4.1). An area needing further investigation is what kinds of institutional arrangements can assist in ensuring better coordination and reconciliation of these issues, to achieve common adaptation objectives (Klein et al., 2014).

7.5.1.4. RSCP: Political barriers

Political barriers[67] related to councillors trying to control projects that come into their communities, both in terms of who is given employment and in terms of how funds are disbursed. They do this because appearing to bring projects to their communities is likely to result in community favour and votes, but means that politicians support projects that have short-term as opposed to long-term gains (Ziervogel & Parnell, 2014). Many of the interviewees indicated that traditional leadership (chiefs and headmen) had the community's interests more at heart than the political leadership did. This is articulated by CHDM 6 who said in reference to councillors: *"I believe it's like, when there is something beautiful, something nice happening here, it must come through them, if it is from someone else, then it is not good enough."* Pasquini et al. (2013) found the same issue at play in the Western Cape, where the perception that politicians are primarily concerned with personal gain (keeping their well-paid positions), as opposed to dealing with issues of 'social good', was apparent.

7.5.2. Cognitive and normative barriers

CC was associated with fear-linked events, such as disasters, extremes and dire predictions. A school teacher (CHDM 6) said that CC will affect *"whether you will be able to plant one potato or even mielies and we are very much concerned, we don't know how we will survive"*. Terminology such as *"it's a threat"*, *"die"* and *"concerned"* were used by the interviewees in relation to CC; these terms are unlikely to inspire action. A barrier, which exacerbates these negative perceptions of CC, is that many of the teachers interviewed found it difficult to link CC to human influences. This runs counter to the impetus needed for personal actions, beyond dealing reactively with an event during or after it occurs (Vogel et al., 2007). CHDM 8 indicated that people in their communities (poor, rural) see weather and climate as something natural and in God's domain, and therefore changes in the climate are due to

[67] The code 'politically related' received 10 references in the semi-structured interviews.

God and/or the ancestors wanting to punish them; climatic events were often attributed to witchcraft. CHDM 8 said: *"I am also having that connotation, as I really do not know if there will ever be anyone to stop this, it's just natural, if it is natural, it comes straight from God"*. Traditional/cultural responses to climatic events that interviewees indicated were adopted, included shacking tins and calling on Sangomas to assist. These responses were reactive as some felt that *"when the dooms day comes... we are doomed"* (CHDM 8). On this occasion, traditional responses may not have directly contributed to improved community resilience, but there are many examples where traditional responses do just this. Just before the Indian Ocean tsunami that occurred in 2004, the sea withdrew, attracting people to witness this spectacle. The indigenous communities in Thailand, India and Indonesia, did not follow suit, but instead headed rapidly inland knowing that this subsidence would likely be followed by a tsunami-type event (Elias, Rungmanee, & Cruz, 2005). Traditional responses are often based on experiential knowledge, entrenched in the local context, which as in the case discussed above, can often be vital in responding to events.

Despite the difficulty in linking climatic changes to human influence (discussed above), school teacher interviewees felt that rural communities needed to mitigate CC, despite the fact that their contributions to emissions are relatively small. Some of the teachers interviewed said that the community should not burn wood, should grow its own food and should not seek out a materialistic lifestyle, as this will contribute to the causes of CC. The reason for these opinions is likely due to the fact that the teachers interviewed were clearly passionate about CC and environmental issues, and were relatively well educated as to the importance of CC. I would hypothesise that their views are not reflective of the opinions of broader society. Taylor et al. (2014, p. 73) confirm this by stating that the majority of poor South Africans *"hold aspirations and expectations of development that replicate infrastructure, technologies, goods and services that are currently enjoyed in affluent communities."* Discouraging poor communities' aspirations for these things, brings to the fore moral dilemmas related to SA's Apartheid history, which restricted access to opportunities and services along racial lines; and also links to the discussion in Section 9.6.4, with regards to the roll out of 'green technologies' into poor South African communities.

7.6. RESOURCE BARRIERS

Resource barriers were referred to mainly by those involved in planning and implementing CC work (CHDM 1 - 4), and mostly in relation to financial and human resource barriers, which were often linked, as well as knowledge, communication and technology barriers.

7.6.1. Financial barriers

Financial barriers related to: (a) not enough funding/budget for CC work (also found in the systematic literature review, see Section 4.3.3.2); and (b) the complicated procurement system making it difficult to procure the right service providers and goods timeously[68]. I deal with (a) here, as (b) was also coded as an organisational barrier and discussed in Section 7.5.1.1. In relation to the RSCP, CHDM 1 stated: *"that's the biggest draw-back of the whole project, everybody can see that it's working, but nobody says there's the money, roll out the project."* CHDM 1 was particularly disillusioned with CHDM's ability to attract national funding at the time of the pilot and semi-structured interviews, due to numerous funding applications receiving no response. Lack of funding has meant that certain partners working on the RSCP have offered their services at risk, which has negatively affected project relations. The worst case scenario occurred when project partners did not receive payment and stopped working on the project. When project implementation ceased, teachers were limited in what they could do, which relates to the top-down approach with which the RSCP has been implemented; teachers have not been adequately trained to run the project independently. Teachers interviewed spoke about their reliance on external assistance in relation to the project, likely a combination of the top-down approach adopted, as well as the limits to autonomous adaptation (see Section 1.2).

7.6.2. Human resource barriers

Human resource barriers related almost exclusively to the lack of skilled staff to deal with CC[69]. CHDM 1 indicated that human resource challenges have not only made it difficult for the municipality to tackle CC, but have affected the environmental health and environmental management functions too. No CC specific posts have been advertised for CHDM; those dealing with CC are doing so in additional to their core competencies. Even if these posts were to be created, CHDM 1 indicated that he had doubts about whether CHDM would be able to attract the scarce skills related to CC work at the municipal scale.

These human resource shortages have been a particular challenge for the RSCP, exacerbated by the fact that the project sites are located far from each other, and that working with communities requires a significant investment of time and energy; a significant barrier to municipal planned CBA. CHDM 2 speaking about the RSCP, said: *"the only stumbling block is time. I've really battled to be able to put as much energy as I would like into the projects"*. This is an important failing of the project, as it may lead

[68] The code 'procurement system hinders financial flow' received 10 references in the semi-structured interviews.
[69] The code 'lack of skilled staff to deal with CC' received 27 references in the semi-structured interviews.

to the communities losing trust in the project implementers who do not deal with project issues timeously. This being said, only those interviewed at the school where the project had stalled (discussed in Section 7.5.1.3) seemed to have felt the impact of these barriers. Project implementation and maintenance was indicated to have been slow in the other two schools I visited, but interestingly the teachers interviewed were so grateful for the project and so used to waiting long periods of time for services and assistance (historically under-serviced areas), that the delays did not seem to affect their attitude towards the RSCP. This culture of acceptance was expressed by CHDM 7, who was thankful when CHDM 2 brought seedlings to his school, and indicated that he had been praying and waiting for them.

To overcome these human resource barriers, both CHDM 1 and 2 indicated that what was needed was municipal staff tasked with dealing with CC and the RSCP with 100% of their time. They saw on-the-ground area specialists as particularly important to the sustainability and roll out of the RSCP. CHDM 1 emphasised these human resource barriers, as they overlay with other barriers, by saying:

> *Look again, its buy-in from departments, that's the main thing, and funding. I think that's the main issue and funding links to a various lot of things, not just for projects, to get in the relevant people on-board, because I'm not a CC specialist, I'm not an environmentalist, I by accident got involved… We need people in local government that is solely focused on CC and renewable energy issues. Um, now our Mayor took a decision that we must establish a CC unit, its fine, but again the CC specialists, even if we earn big salaries here, they will not come to local government, they earn ten times more outside, because there's a handful of them… I'm so cut in to pieces, dealing with things, I can't focus on one thing, and give 100% of my time to it... So you need a dedicated unit…*

The CC unit that CHDM 1 refers to in this quote, was something that he indicated was often discussed by municipal management, but at the time of writing, it had not been established. Perhaps one of the reasons that municipal management have battled to establish this unit, is because municipal mandate for CC is not clear; an issue raised strongly during the feedback session. Lack of mandate can also be described as 'missing means': the legislative framework hindering CCA (Eisenack & Stecker, 2012). Hence, CC has only been taken forward if individuals with other functions are passionate about it, willing to work additional hours, and innovative in how they garner funding and human resources to pursue CC interventions. Despite this dedication, these individuals are often not able to allocate the necessary time to the CC work as they have various other responsibilities to fulfil, which has been a contributing factor to projects not being well maintained, procurement blunders and project partner

relationship break-downs. The human resource challenge, an acute issue in CHDM, is not unique to this municipality. Mukheibir et al. (2013) found that smaller and more remote municipalities in Australia, in particular, battled with insufficient technical and human resources.

7.6.3. Knowledge and communication barriers

High-level decision makers and municipal staff (both district and local municipalities within the Chirs Hani district) have battled to engage with CC due to their lack of CC knowledge[70]. Reports such as the CC Response Framework (Coastal Environmental Services, 2011) have been unable to overcome this barrier (see Section 7.3.2). CHDM 38 indicated that two workshops were held to discuss the framework with various municipal departments, but they were poorly attended. Those that did attend the workshops did not occupy high-level positions in the municipal sectors that conduct core municipal functions and are therefore well resourced and powerful (such as housing, engineering, and economic development), which is indicative of a lack of buy-in and prioritisation of CC. CHDM 1 indicated that CC is often seen as "*just another thing that must be done"*. Hence, lack of CC knowledge is exacerbated by cognitive barriers, such as a lack of prioritisation of CC, as well as human resource barriers, where staff are overburdened due to staff shortages. Human resource barriers leading to knowledge barriers, were expressed by CHDM 4 and 5, who indicated that they found it difficult to perform their environmental education function, as they were the only two staff tasked with running educational campaigns across the whole district (a 36 558 km^2 area, see Table 7.1).

Insufficient knowledge was also discussed by the teachers interviewed; CHDM 5 said: *"We don't have knowledge, knowledge is the problem."* The lack of education and training of school teachers, children and community members in relation to the functioning of the RSCP, has led to one of the main goals of the RSCP not being fulfilled: the school and community running the project independently. The fact that this has been an aim of the project, as expressed by CHDM 1, is important, as attempting to make the project community-run would bring the project closer to CBA as defined in the literature (see Section 2.4). Unlike EM, CHDM has battled, due to human resource shortages, to document the RSCP progress and lessons learnt to date. Hence, an aim like educating communities to run projects (the value of which has been experienced first-hand) is knowledge held by a few individuals, and if they leave the municipal environment, they go with this information. Furthermore, lack of documentation also hinders the monitoring and evaluation necessary to systematically improve the RSCP over time.

[70] The code 'lack of CC knowledge' received 11 references in the semi-structured interviews.

Knowledge and communication barriers were also seen to manifest in relation to the Environment and CC Forum, which is the main intervention for CC upskilling in the district. These forum meetings involved one-way interactions, where 'experts' communicated technical knowledge to local and provincial government staff. Participation from the floor at these forums was highly regulated and limited, making it hard to judge whether knowledge and understanding had been gained by those attending the forum. Attempting to deviate from this *modus operandi*, as I did during my feedback session, was not encouraged (see Section 7.2.1). Lack of learning, which may be entrenched by these one-way interactions, was discussed by CHDM 36 who noted during the feedback session that CC remains abstract to councillors. She said that it needs to be made more understandable and tangible for them to act on it: *"As councillors, we can only support what we understand. Don't say it's technical, we want to understand the technical part of CC... We are ready for technical."* This is both a positive and negative statement: it shows a councillor's interest and commitment to CC, but also alludes to the broader issue of CC communicators failing to make CC science relevant to their audiences.

This one-way communication aligns with how science and policy/practice have been traditionally linked, via a linear and unidirectional process (Vogel et al., 2007). Dealing with the science/practice divide in this way has been widely critiqued, with authors such as Vogel et al. (2007) recommending that interactions that resemble a spider web of complex and multi-scalar interactions are far more beneficial, especially when they blur ideas of traditional roles and even scientific processes (Vogel et al., 2007). Nowotny et al. (2001 as cited in Vogel et al., 2007) argue that scientific knowledge should gain robustness not just from peer-review (often socially-detached), but also from its embeddedness in society. Enabling these *"polycentric, interactive, and multipartite processes of knowledge making"* (Vogel et al., 2007, p. 352) within institutions with established ways of doing things, and facing significant resource challenges (as is the case in CHDM), will require significant will and commitment.

7.6.4. Technology barriers

Technology barriers[71] were discussed by interviewees in relation to the need to tailor technology to the local context, which takes specialist skills and time (linked to the issue of procuring specialist services, Section 7.5.1.1), as well as the need to educate and train community members to maintain and run the technology implemented (see Section 7.6.3). What is discussed in this section relates to the technology (see Figure 7.3) installed; however the issues are in fact not caused by the technology itself, but poor management of it. It was the lack of partnership coordination (Section 7.5.1.2) and lack of human resources (Section 7.6.2) that caused project technology to not operate optimally. The

[71] The code 'technology barriers' received 2 references in the semi-structured interviews.

overlay of these barriers resulted in the following issues: (a) a project's biodigester stopped working due to lack of liquid through-put during school holidays; (b) a project's algal ponds not being aerated adequately on windless days as the wind turbines were not turned manually; and (c) installed gas stove-tops were too small for the large pots used for cooking. These issues led to: (a) reduced production of biogas; (b) decreased algal polishing (cleaning) of effluent; and (c) difficulty in cooking food for the school children. Both CHDM 1 and 2 acknowledged that they needed to run more in-depth community training and develop a training manual that could be used by community members on site, so that the school teachers and/or community members could run the technology independently. Training these individuals to run the projects independently, would go a long way in: (a) alleviating the human resource barriers discussed in Section 7.6.2; (b) improving the efficiency of project implementation and maintenance; and (c) bringing the RSCP closer to the definition of CBA (Section 2.4), by increasing the community-led aspects of the programme, improving community knowledge and skills, and increasing community buy-in.

7.7. CONTEXTUAL BARRIERS

Interviewees discussed concerns related to high levels of poverty, teenage pregnancy, high school drop-out rates, illiteracy, HIV/Aids and crime. These socio-economic challenges increase the vulnerability of CHDM residents to the effects of CC. Interviewees felt that they were already experiencing climatic changes, such as seasonal shifts and more erratic and extreme weather conditions. Hence, contextual barriers related to both vulnerability under existing socio-economic conditions, and vulnerability under existing climatic conditions (see Section 5.2). There is no doubt that CHDM is particularly vulnerable to CC; existing challenges expressed in Section 7.1 are likely to be exacerbated by CC projections, especially in relation to water issues (also see Section 7.3.4).

7.8. ENABLERS

7.8.1. Promoting projects with ancillary benefits

A significant enabler of the RSCP, has been that it yields ancillary benefits[72]. CHDM 1 said: *"I think that's where the success was in* [the RSCP], *they understand why we're doing this, and how it can benefit them and benefit service delivery, health, food safety, nutrition, everything".* The RSCP is providing real, tangible benefits in the now (listed in Table 7.2), which have been vital in attaining buy-in[73] from school teachers, school children and from the surrounding communities (all three groups,

[72] The code 'projects with multiple benefits' received 17 references in the semi-structured interviews.
[73] The code 'gaining community buy-in and trust' received 27 references in the semi-structured interviews.

making up the school community). This buy-in has also been enabled because the school communities were open to new ideas[74] and motivated[75]. Community structures were also used to good effect when implementing the projects[76], by consulting traditional leaders before projects began.

Table 7.2. Ancillary benefits of the RSCP (also refer to Figure 7.3)

Project component	**Benefit**
(a) Provision of small-scale renewable energy to run essential school appliances.	Reduces electricity costs and allows the school to function when grid-based electricity is not available.
(b) Sanitation system: flush toilets and biogas digester.	Improves hygiene at the schools and hence, the health and well-being of staff and students.
(c) Water conservation technologies: JoJo tanks attached to the school's roof gutters and piping between toilet sink and toilet cistern.	School has more water, both for general use and food production.
(d) Production of biogas, which is utilised in the school's kitchen for gas cooking.	Reduced need to burn wood or liquefied petroleum gas to cook food for the school children; reducing both time and economic costs.
(e) Food gardens, which are fertilised by the polished (cleaned) biogas digester effluent.	The school children receive a healthy meal every day that is supplemented by the food garden produce.
(f) Learning and education that occurs alongside the project, in relation to the project components as well as sustainability in general.	This has stimulated a passion for environmental and CC issues in teachers and children at the schools.

The benefits of the new sanitation system (Table 7.2[a]) are represented by the following quotes from CHDM 6 and 7 respectively:

> *We used to have a pit system which now is at least a flush toilet system which is good and we are proud of that and there are no flies that causes diseases around the school all of the time... There are no sickly children at the present moment…*
>
> *Other schools they do not have that system, they use the old system, like bucket system, and these things make a bad smelling, and they come a lot of flies in the summer times. That's why I make it a challenge to all the schools in the communities, and urban areas, they must use this system, because they protect our lives and health.*

The provision of a hearty meal to the students (Table 7.2[e]), according to CHDM 5 and 6 has led to an increase in school attendance rates: *"every child is willing to go to school, because he's going to get a meal at least"* (CHDM 6). The food gardens have also been able to supply a small income for the schools, via the sale of excess crops: *"last year, when close school, we raised R 6400 from our vegetable garden"* (CHDM 9). The educational component of the project (Table 7.2[f]) has been important in

[74] The code 'community open to new knowledge' received 8 references in the semi-structured interviews.
[75] The code 'working with motivated communities' received 6 references in the semi-structured interviews.
[76] The code 'utilising traditional structures' received 3 references in the semi-structured interviews.

stimulating a passion for issues of sustainability, as CHDM 5 states in relation to the school children: *"I believe that maybe some of them can also help in educating their parents about this CC, because they are hands on in the project, so these projects are very, very good."*

There is an overall boost in well-being within the schools where the RSCP is implemented and a pride in relation to the project, especially with regards to the flush toilets (Table 7.2[b]):*"If there is a learner, they have made a mistake, they will come and report, becuase they know that we are the only school that has got flush toilets"* (CHDM 9). This pride in the system is also reflected by the cleanly state with which the toilets are kept (maintained by the school children), see Plate 7.1.

Plate 7.1. A toilet cubicle at one of the schools where the RSCP has been implemented

Buy-in has been bolstered by the fact that schools were chosen based on them having an interest in sustainability issues (had developed a food garden independently) and having a dedicated set of teachers that could take the programme forward[77]. A Department of Education representative assisted in identifying the schools; which is reflective of inter-governmental collaboration. The dedication of the school team involved in the flagship project at Three Crowns Primary School was discussed in a DBSA report: *"an exceptionally dedicated school team made up of the headmistress, the teachers, a passionate janitor and an active, supportive parent community"* (DBSA, 2011, p. 26). This project, which has had the most money and expertise invested in it, and is seen as a pilot initiative[78], has inspired other schools and communities.

[77] All schools were chosen this way, bar one, which CHDM 2 indicated was a political decision.
[78] The code 'pilot projects' received 6 references in the semi-structured interviews.

So significant are the ancillary benefits that CC was in fact not the initial motivating factor for the project, but rather the aim was to implement a sustainable programme that had community buy-in and improved service delivery and community health. The CC benefits were acknowledged though and articulated more fully during and post COP17. The RSCP is good for school communities whether CC is a reality or not. The typical CC project process of ascertaining CC impacts and then planning for them was not followed, instead the present context from a social, economic and ecological perspective was considered. Hence, the RSCP aims to improve generic capacity (improving human development), as opposed to specific capacity (improving capacity to deal with specific climate threats) (Eakin et al., 2014). However, it must be said, that dealing with existing vulnerabilities related to food insecurity, energy insecurity and poor sanitation, as well as educating school communities about sustainability (as the RSCP does), is likely to increase resilience to a CC-influenced future. But this does not mean that the RSCP projects are CBA interventions. Reid et al. (2009) state that even though CBA projects may look like 'development as usual', they must take CC impact information into account to be considered 'true CBA'. Consideration of CC impacts, while ensuring that community members experience 'quick wins' is advocated by Reid and Schipper (2014), as an enabler of CBA success. This is not a cut-and-dry issue; CC impacts for CHDM had been assessed via the CC Response Framework, and based on the understanding gained from the framework, officials knew that the RSCP would have CC benefits.

The promotion of ancillary benefits more directly linked to the core mandate of local government and existing needs of school communities, such as service delivery, was essential in gaining political and community buy-in. This represents an important lesson in CCA project implementation, especially in the developing country context, where existing developmental challenges are significant and ignoring them in favour of dealing with future impacts can lead to deviating resources away from present challenges. On the other hand, an argument could be made that the school community's buy-in may have been the same if the programme had provided food, energy and water in less sustainable ways, e.g. food brought in from urban areas, bulk fossil fuel powered electricity, and piped water. Interestingly, unlike many CC/sustainability-linked interventions which are more expensive than traditional development interventions, the cost of rolling out the RSCP across the sparsely populated CHDM would be cheaper than delivering bulk services. Hence, as was indicated by CHDM 1, the roll-out of the RSCP is not hindered by its cost in comparison with traditional means of service delivery, but by set mind-sets in relation to business-as-usual municipal service delivery. It is the ancillary benefits of the RSCP that improve its cost: benefit ratio, as well as the programme's ability to be integrated into existing decision making (Klein et al. [2014] discussed how this is often the case with

CCA projects with ancillary benefits).

Another lesson, made apparent by the RSCP, is that implementing community level projects at schools is a useful approach. The school environment has contributed to: (a) educational components of the RSCP being supported by school teachers; and (b) the project being implemented in a safe and stable location, which teachers can control, ensuring that school children receive the benefits of the project. The aim to move the RSCP into the community more broadly has already experienced certain challenges, in relation to project location, responsibility and benefactors.

7.8.2. Partnerships and networks

Partnerships and informal networks[79] between skilled and passionate individuals[80], have been crucial to the RSCP and the CC work in general in CHDM, as represented by this quote from CHDM 2: *"I think partnerships are a large part of the option, I don't think any one organisation can do it on their own, there's just not enough capacity…"* This enabler has been particularly important in the CHDM context, due to severe human resource shortages (discussed in Section 7.6.2). These partnerships and informal networks were essential in the initiation and development of the RSCP, in relation to: (a) the good working relationship between CHDM 1 and 2; (b) the identification of schools which were suitable for project implementation by a Department of Education colleague; and (c) the involvement of consultants that had been working on a DBSA funded project and were passionate about innovative community projects. Of particular importance has been the government/NGO partnership, where CHDM has been able to generate the necessary funds for project implementation (via DBSA or in-house funding), with WESSA providing human resources, innovative ideas and technologies, as well as community education, training and development. More specifically, CHDM 1 and 2 adhere to a similar discourse and have a passion for making a difference at a community level: *"none of us stand to benefit beyond the enjoyment of the work… we keep plowing ahead because we believe in what we're doing and also we've had each other's backs along the way..."* (CHDM 2).

Interestingly, the organic beginnings of the programme, which contributed to the barrier - poor coordination issues in partnerships (Section 7.5.1.3) - was essential to the initiation of the programme - *"it really was a situation there just being the right energy at the right time, and things kind of really just slotted into place..."* (CHDM 2). Innovative budgeting was required in how DBSA and municipal funds were used to run the programme. The fact that CHDM 2's time was funded by Eskom's Energy

[79] The code 'partnerships' received 10 references and the code 'informal networks' received 2 references in the semi-structured interviews.
[80] The code 'skilled, passionate, driven human resources' received 8 references n the semi-structured interviews.

and Sustainability Programme also assisted the programmes' progress. Linked to this is the fact that skilled and passionate individuals that had come together for the DBSA-funded project contributed to the ideas which eventually led to the RSCP (overcoming human resource and knowledge barriers). CHDM 1 played the essential role of CC champion, driving the municipality's CC work despite numerous barriers.

7.8.3. Education and learning from others

Most of the interviewees mentioned the importance of awareness raising and education[81]at all levels of society, from municipal officials living in urban areas to deep-rural communities, with those educated through the RSCP valuing the knowledge gained. CHDM 1 indicated that awareness raising and education would be a key focus area of the RSCP going forward; to educate and train community members to run the projects independently, as well as to establish a learning centre at Three Crowns Primary School.

CC knowledge has been bolstered by learning from best practice[82]. Municipal staff have attended international and national conferences and learnt from other South African municipalities. These experiences stimulated ideas and passion in local-level CC champions, who are essential in driving municipal CC work. CHDM 1 is highly vocal about the RSCP and the importance of considering CC at the local level and has won high-level political and administrative buy-in[83] for the RSCP and the CC work in general. This has also been enabled by the fact that CHDM is a relatively small organisation, allowing CHDM 1 access to the Mayor and City Manager on a daily basis. This accessibility is not available to junior staff though and was emphasised by CHDM 4 as a challenge.

High-level support for CHDM's CC work been stimulated by events[84] and awards. Prior to COP17 most municipalities across SA were encouraged to consider what CC may mean for them (see Section 7.3.3). The RSCP's flagship project at Three Crowns Primary School has won numerous awards (e.g. Leadership in CC Award and All Africa Public Service Innovation Award) and received much attention. The school is now famous within the region (the downside of which is that the school experiences various interruptions due to visitors wanting to view the project). The reputation that Three Crowns Primary School has, has encouraged other schools to want to develop similar systems. We visited a school that was inspired by the project at Three Crowns and used money won from a Department of Environmental Affairs competition to start a school garden and build a greenhouse, in the hope that

[81] The code 'awareness, education and training' received 9 references in the semi-structured interviews.
[82] The code 'learning from best practice' received 9 references in the semi-structured interviews.
[83] The code 'leadership: high level buy in and will' received 8 references in the semi-structured interviews.
[84] The code 'big events' received 6 references in the semi-structured interviews.

their initiative would be noted and the RSCP implemented at their school. CHDM 2 indicated that an important criterion for selecting RSCP schools is whether they had started a portion of the project themselves. This criterion brings the RSCP closer to the CBA principle of initiatives being bottom-up and community-led (see Section 2.4.1).

7.9. RELATING THE BARRIERS AND ENABLERS DISCOVERED TO CBA

The organisational and discursive barriers identified in CHDM are barriers to work that requires: (a) innovative use of a complicated financial management system (see Section 7.5.1.1); (b) reflexive, as oppose to tick-box/target-driven processes for the achievement of objectives (see Section 7.5.1.2); (c) trust-based partnerships across multiple sectors (see Section 7.5.1.3); and (d) work that prioritises the lives of the most vulnerable, not the privileged few (see Section 7.5.1.4). CBA, as much, if not more than CCA, requires what is listed above.

Education/awareness-raising and training in a two-way fashion, where both 'expert' and indigenous knowledge are valued equally, a core principle of CBA, would be a key enabler for overcoming the two cognitive and normative barriers discussed: (a) CC being perceived as overwhelming; and (b) cultural/traditional perceptions/norms leading to reactive responses (Section 7.5.2). Only when the perceptions and traditional understandings that communities have in relation to CC are fully understood, can municipal officials work with community members to develop solutions which are sustainable into the future and community-led; i.e. CBA interventions. The principles of CBA are difficult to implement in contexts where the governance approach is top-down, where resources are severely restricted (in CHDM these resource shortages relate to a lack of: CC knowledge, funding, and skilled staff), and contextual challenges significant, all of which exist in CHDM. This being said, certain aspects of the RSCP were found to be in alignment with CBA, in relation to: (a) schools being selected, in part, based on whether they had initiated a sustainability practice themselves (Section 7.8.3); and (b) an aim (articulated by interviewees) of the RSCP being that the projects are run relatively independently by the school communities (Section 7.6.3). Further achievement of CBA principles (see Section 2.4) are important to aim for, as their achievement will lead to communities breaking their dependence on government and a shift in power relations in ways that empower them to chart their own future.

The enablers of: (a) projects with ancillary benefits; (b) partnerships and networks; and (c) education and learning from others, provide useful means for developing CBA in CHDM. The RSCP provides a tangible example of how rural service delivery can be done differently and be used to address multiple

aspects of vulnerability. Gaining a better understanding of CHDM's CC future[85] will strengthen the programme, by ensuring that it considers future impacts as much as present challenges. The partnerships and networks could be expanded upon, to improve municipal/community relations. As discussed above, the aim expressed by interviewees, to increase community independence in running the RSCP, is indicative of CBA principles. If this aim is taken forward, and achieved in existing and future projects, the RSCP will even more so, be an exemplar of municipal enabled CCA that benefits communities.

[85] which could be achieved by producing the CC Response Strategy spoken about in the Integrated Development Plan, see Section 7.3.4.

CHAPTER 8: CITY OF CAPE TOWN

8.1. INTRODUCTION AND BACKGROUND TO THE CASE STUDY

The City of Cape Town (CoCT) is considered to be one of SA's leading municipalities with regards to its pioneering energy and CC work (CoCT, 2014c), as well as an 'early adaptor' in relation to the city's work in assessing existing and potential climate risks, identifying CCA measures, and developing networks with relevant stakeholders (Taylor, in press). Contextual information relevant to the CoCT, which can be compared to the other three case studies, is housed in Table 8.1.

The CoCT economy is dominated by *"finance and business services, manufacturing, trade and hospitality, and community services and general government"* and it is the *"second-largest contributor to SA's total GDP* (Gross Domestic Product)*"* (CoCT, 2014a, p. 15). It faces significant social, economic and ecological challenges, which are overlain by CC (Table 8.1). The Western Cape Province, within which the CoCT is situated, is expected to be one of two South African provinces most affected by CC-induced warming and precipitation change (Mukheibir & Ziervogel, 2006). The CoCT is likely to be the metropolitan area in SA most affected by water shortages, due to its existing dry climate, with CC projections indicating a drying trend, overlain by expected population growth (Mukheibir & Ziervogel, 2006). The city also faces significant challenges in relation to CC-induced sea level rise. Protecting the coastline from rising waters and extreme events is important from social, economic and ecological perspectives, the city's coastline being *"arguably its single greatest economic and social asset"* (Cartwright, Brundrit, & Fairhurst, 2008, p. 3).

Table 8.1. Contextual information relevant to the CoCT

Type of municipality	Metropolitan
Main city/town(s) governed	Cape Town
Population size	3 740 026 (StatsSA, 2011)
Size of area under municipal jurisdiction	2 461 km^2 (CoCT, 2011a) (see Figure 8.1)
Rural/urban split	Predominantly urban and peri-urban.[86]
Budget and economy	Tourism, financial services, manufacturing, wholesale and retail trade, and property markets are key sectors of local economic activity (Taylor et al., 2014).
Social, economic and ecological challenges	• High levels of inequality in relation to income levels, employment opportunities, access to public services, diseases, violence and crime (Taylor et al., 2014). • Many of the native species that form part of the six vegetation types that are endemic to Cape Town are under threat of extinction due to habitat fragmentation (Rebelo et al., 2011 as cited in Taylor et al., 2014).
CC projections/impacts	• Increased temperatures and decreased rainfall, leading to increased water stress.

[86] 89.6% of the Western Cape population lives in urban areas (PROVIDE, 2005), this is assumed to be an even higher percentage for its largest urban centre: Cape Town.

(Mukheibir & Ziervogel, 2006)	• Sea level rise. • Changes in fire intensity and frequency.

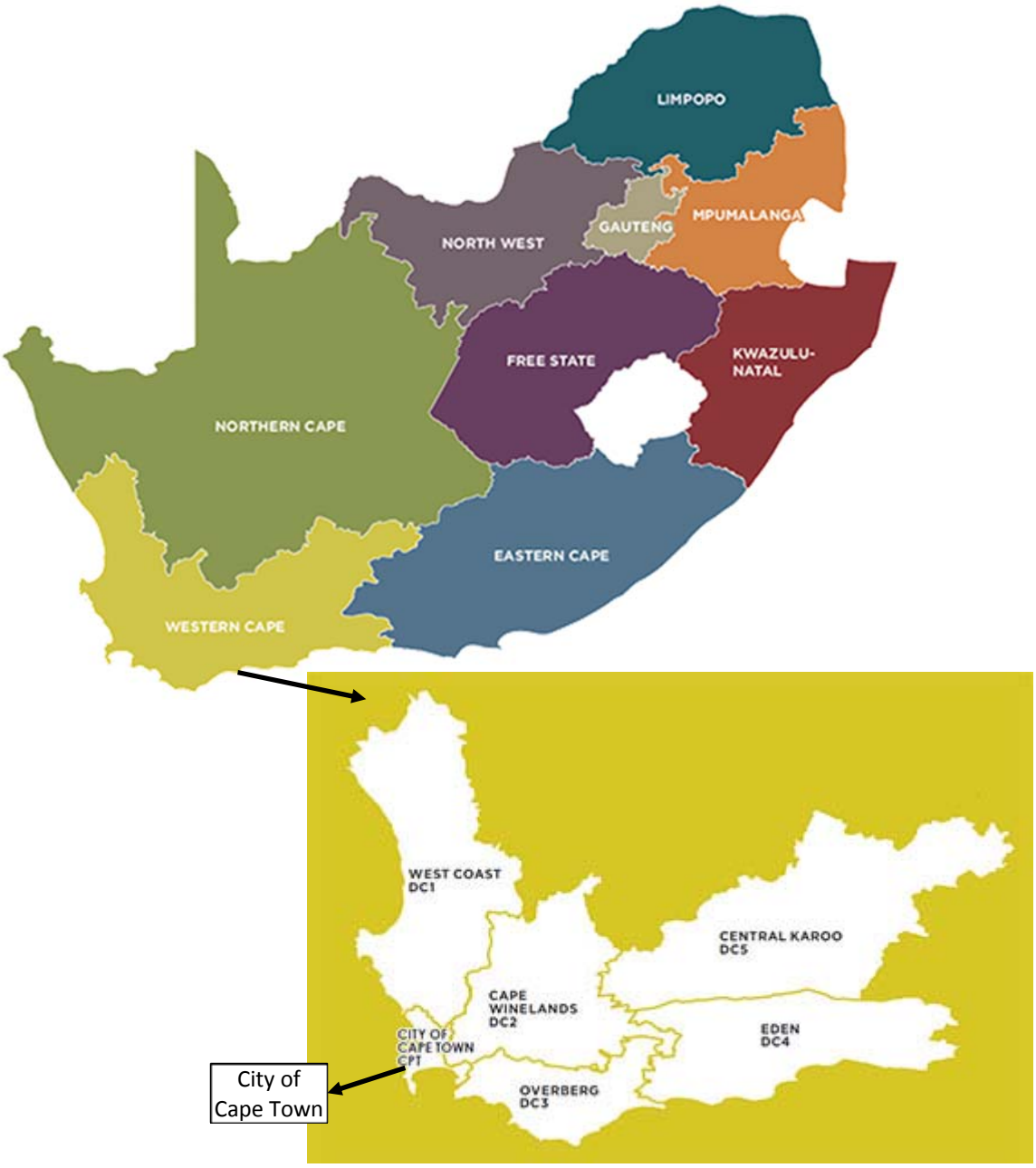

Figure 8.1. Map indicating the CoCT's locality within SA (images from the Local Government Handbook, 2015)

8.2. SPECIFICS OF METHODS

Semi-structured interviews were held with CoCT 1 and CoCT 2 (see Table 5.3) on the 20th of February 2013. These interviews were recorded, transcribed and analysed as described in Section 5.6. A pilot interview was not required for the CoCT case study as a large amount of publically available

documentation could be sourced on the city's CC work prior to the interviews. Additional information was garnered in relation to the CoCT's CC work by: (a) conducting an in-depth conversation with a provincial government official involved in CC work within the Western Cape (20 February 2013), which was recorded and transcribed for reference; (b) by attending a CCA monitoring and evaluation workshop held in Cape Town on the 19th of February 2013; and (c) interactions with CoCT officials working in the water sector of the municipality, at a Climate Services workshop on the 4th of March 2014. These interactions informed the information housed in Textbox 8.1, which was sent to CoCT water sector officials for verification, with e-mail correspondence indicating that the text was a *"good reflection of the CC issues we face here."* A feedback session was held with CoCT 1, with expert verification by CoCT 3 (Section 5.7) on the 29th of August 2014.

8.2.1. Methodological considerations

I had encountered both CoCT 1 and 2 while working for EM and hence they may have associated my CC views with those held by key CC proponents in EM. It was thus important for me to separate myself from the discourse and practice of EM and clarify my role as an independent researcher. As is indicated in my methods (Section 5.5.1) I interviewed municipal staff central to the municipality's CC work, as these individuals were likely to have the best understanding of barriers and enablers to this work. In the CoCT this resulted in interviews with CoCT 1 and 2. To bolster my findings beyond interactions with these two individuals, I interacted with other officials at workshops, and consulted multiple secondary sources of information, which are readily available as much research and documentation of the city's CC work has occurred.

8.3. CASE STUDY CONTEXTUALISATION: THE EVOLUTION OF THE COCT'S CC POLICY AND PRACTICE

Researching the evolution of the CoCT's CC work via document review, assisted in contextualising the case study. The milestones summarised in Figure 8.2 and listed with brief descriptions in Sections 8.3.1 - 8.3.7 interacted with barriers and enablers to the city's CC work, which are discussed in Sections 8.5 - 8.10.

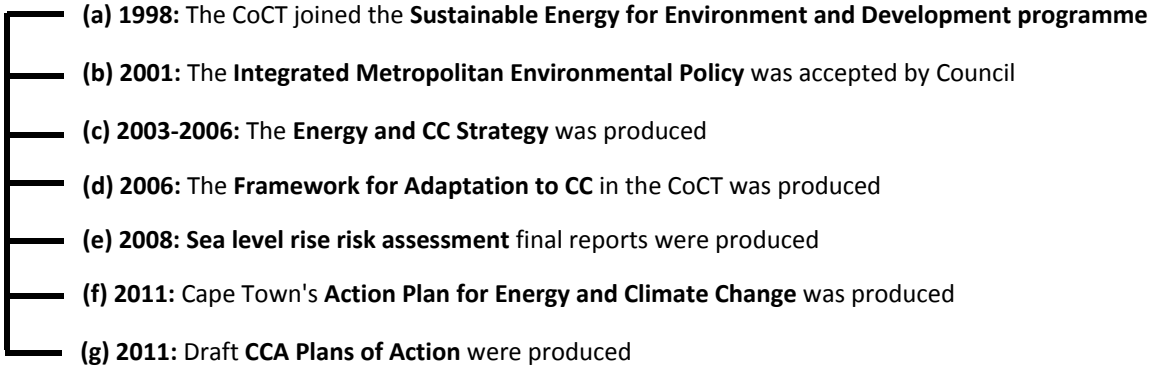

Figure 8.2. Timeline of selected CC milestones in the CoCT

8.3.1. Joining the Sustainable Energy for Environment and Development programme

Work on energy and CC began in 1998, when the CoCT joined the Sustainable Energy for Environment and Development (SEED) programme (Figure 8.2[a]), which has the core aim of integrating *"sustainable energy and environmental concerns into urban development in SA"* (Sustainable Energy Africa, 2014, p. 1). Both the Energy and CC Strategy and the Framework for Adaptation to CC in the CoCT discussed below, were enabled through this programme, which was funded by DANIDA (Taylor et al., 2014).

8.3.2. The Integrated Metropolitan Environmental Policy

The Integrated Metropolitan Environmental Policy (IMEP) (Figure 8.2[b]) was approved by the CoCT's Council on 31 October 2001. This policy mentions CC only once, in relation to the goal of developing an Energy and CC Strategy within five years from its publication. Separate provision is made for the development of a Coastal Zone Management Strategy, a Biodiversity Strategy, an Environmental Education and Training Strategy, and a Stormwater Management Strategy, all of which will be influenced by CC issues (CoCT, 2001).

8.3.3. The Energy and CC Strategy

The Energy and CC Strategy (Figure 8.2[c]) was produced by various stakeholders working on energy issues (e.g. Sustainable Energy Africa [NGO], the National Energy Regulator, and University of Cape Town's Energy Research Centre [CoCT, 2006]) and focuses on energy initiatives and visions. The final section of the strategy is entitled 'vulnerability and adaptation', where it is stated that:

> *in terms of this strategy, the CoCT aims to assess the short to medium term impacts of CC in the metropolitan area by determining the degree to which existing systems can adjust in response to, or in anticipation of, changed climatic conditions* (CoCT, 2006, p. 52).

8.3.4. Framework for Adaptation to CC in the CoCT

The 'Framework for Adaptation to CC in the CoCT' (Figure 8.2[d]) presents the scientific and policy background of CC, and outlines a process for CCA, which begins with assessing the impacts, and ends with monitoring and evaluating interventions (Mukheibir & Ziervogel, 2006). It focuses on CCA-relevant sectors such as urban water supplies, stormwater, biodiversity, fires, coastal zones, livelihoods and health, and presents potential impacts and response measures for these sectors (Mukheibir & Ziervogel, 2006). Taylor (in press) indicated that this framework has not received much attention from the city's council members or departments other than the environmental department that commissioned the work (in this regard, parallels can be drawn between this framework, CHDM's CC Response Framework [Section 7.3.2], and EM's Headline Adaptation Strategy [Section 6.3.2]).

8.3.5. Sea level rise risk assessment

The sea level rise risk assessment (Figure 8.2[e]) conducted for the CoCT produced three sea level rise scenarios, which were linked to associated economic costs: *"depending on the extent of sea-level rise, between R5 billion and R55 billion worth of tourism revenue, public infrastructure and real estate could be threatened by sea-level rise in any given year during the next 25 years"* (Cartwright et al., 2008, p. 36). The options proposed in response include: no regrets options which apply the precautionary principle (e.g. no additional land reclaimed from the sea), as well as institutional (e.g. enforcing a coastal buffer zone), biological (e.g. dune rehabilitation) and physical (e.g. installing sea walls) interventions (Cartwright et al., 2008). The coastal work, which includes the sea level rise assessment, has not been driven from a CCA perspective, but as a means of protecting the CoCT's economically valuable coastline from extreme events (Ziervogel and Parnell, 2012). This links to the discussion held in Section 6.8.10 in relation to the language used to motivate for CCA action.

8.3.6. Cape Town's Action Plan for Energy and Climate Change

The overarching goal of the CoCT's Action Plan for Energy and CC[87] (Figure 8.2[f]), is to ensure energy security for the residents of Cape Town (CoCT, 2011b, p. 4), which it aims to achieve via ten objectives. The sixth objective specifically deals with CCA and highlights the city's sea level rise risk assessment and economic modelling (Section 8.3.5), financial preparations for CC, the CCA Plans of Action (Section 8.3.7), coastal protection zone bylaws, ecosystem mapping and the need to initiate CC policy. Other initiatives housed in this plan include: (a) developing thermally efficient homes; (b) providing free basic electricity; (c) installing solar water heaters; and (d) enacting energy saving campaigns and training (CoCT, 2011b).

[87] Entitled: 'Moving Mountains: Cape Town's Action Plan for Energy and Climate Change'.

8.3.7. The CCA Plans of Action

The 'Framework for Adaptation to CC in the City of Cape Town' (Section 8.3.4) has been taken forward by the CCA Plans of Action process[88] (Figure 8.2[g]), which has involved staff within the Environmental Resource Management Department and consultants hired to assist with the process, meeting with relevant municipal sectors to develop sector-specific adaptation plans of action. Each sector's plan includes the following sections: (a) background and introduction; (b) the sector's CCA responsibility; (c) the sector's vulnerability and risk; (d) hazards and associated impacts; (e) adaptation interventions; and (f) limitations and constraints. Each sector's CCA Plan of Action should be signed off by the relevant director to confirm that sector's responsibility for the stated interventions. Taylor (in press) indicated that an overarching barrier in relation to the CCA Plans of Action process was that most of the sector representatives saw CC as a distant threat (cognitive barrier) and not aligned with their core functions (organisational barrier). Hence, contributing to the process was seen to be an additional and onerous task, which led to collaboration difficulties, and adaptation interventions remaining within the periphery of departmental tasks (Taylor, in press).

8.3.8. The Integrated Development Plan and CC

The 2014/15 review of the CoCT's Integrated Development Plan for 2012-2017 indicates that *"Cape Town is vulnerable both to the environmental effects of CC (such as rising sea levels and changes in rainfall patterns) and resource depletion (such as water scarcity and shrinking oil reserves)"* (CoCT, 2014a, p. 16). Objectives 1.3(a) and (b) deal with CC issues in relation to the sustainable utilisation of energy and water resources. A number of strong energy initiatives are discussed under these two objectives, e.g. the city's target to derive 10% of its energy from renewable sources by 2020 (CoCT, 2014a). Under the section 'promote appropriate CCA and resilience planning' the CCA Plans of Action intervention is highlighted (Section 8.3.7). The uncertainty of CC impacts is discussed in relation to the need to balance the need for preparedness and proactivity with the uncertainties of CC impacts (see Section 8.7.1.2), by ensuring that CCA interventions are flexible. Thus the adaptation plans will be reviewed and updated continuously, as they move into the prioritisation, implementation and review stages (CoCT, 2014a). Taylor (in press) indicates that despite the CCA Plans of Action being endorsed by the Integrated Development Plan, certain sector programmes remain incomplete in 2014. This is indicative of a disjuncture between policy and action, and counters the assertion that once an issue is housed in a municipality's Integrated Development Plan it will be enacted.

[88] See Taylor (in press) for more details on the CCA Plans of Action process.

The CC Think Tank is also mentioned in the section 'promote appropriate CCA and resilience planning' (CoCT, 2014a). The Think Tank is a hybrid knowledge partnership between CoCT officials, academics, consultants, and business and NGO representatives, who come together to research CC (Cartwright et al., 2012). Adaptation activities (present and future) mentioned include: (a) city-wide ecosystem services mapping and costing; (b) a 15% increase in new storm water design specifications; (c) CC being factored into the 25 year bulk water supply modelling; (d) the sea level rise risk assessment and identification of a coastal protection zone; and (e) flooding interface modelling of city rivers in relation to sea level rise (CoCT, 2014a). Other areas of the Integrated Development Plan that discuss CC are: (a) in relation to conducting feasibility assessments for landfill gas projects that will have CC benefits; (b) how projects that aim to protect ecological infrastructure will promote CCA and mitigation; and (c) how inland and coastal water quality initiatives will increase sustainability, resource efficiency and CC resilience (CoCT, 2014a).

The CoCT's social justice concerns are reflected by the city's focus on poor and vulnerable communities, represented by statements in the Integrated Development such as: "*The state, in its various guises, must perform a range of functions, including providing support to the poor and vulnerable"* (CoCT, 2014a, p. 28) and "*the development of programmes that focus on the well-being of the most vulnerable and marginalised will turn the notion of 'a caring city' into a practical reality, with an emphasis on the poor, vulnerable and marginalised"* (CoCT, 2014a, p. 70). The Integrated Assessment Plan indicates that the city prioritises protecting vulnerable communities from floods, as well as improving their living conditions and providing jobs and socio-economic opportunities for these communities. A number of poverty alleviation, youth focused, gender equity and disability focused programmes are discussed throughout the Integrated Development Plan (CoCT, 2014a). The integration of CC within these programmes is not mentioned though, despite the fact that CC is likely to negatively affect poor and marginalised communities' well-being.

8.4. KEY BARRIERS AND ENABLERS IDENTIFIED

Figure 8.3 provides an overview of the barriers and enablers experienced in the CoCT, informed by analysis of documents, semi-structured interviews and informal discussions and interactions. I found it particularly difficult in this case study to separate out and classify the barriers experienced, as is apparent in Sections 8.5 - 8.8 the barriers were found to overlay significantly. In reality, *"actors are challenged to navigate multiple, interacting constraints in order to achieve a given adaptation objective"* (Klein et al., 2014, p. 911). I begin the next section by dealing with a cross-cutting issue related to different interpretations of what is required to deal with CC within the CoCT, which alludes

to a broader issue relating to the multiple pathways which can be chosen to deal with CC (discussed further in Section 10.2).

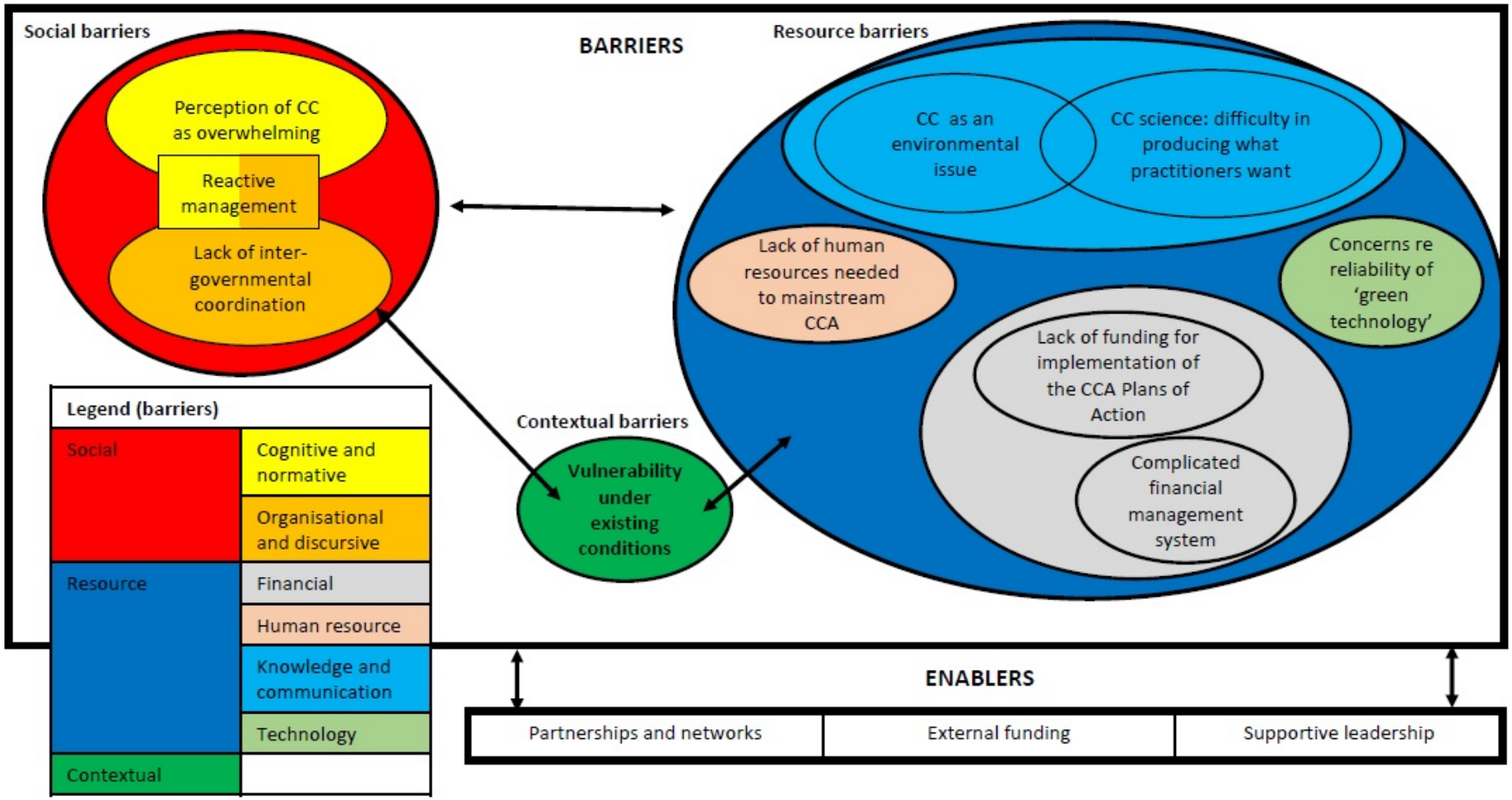

Figure 8.3. Overview of the barriers and enablers identified in the CoCT

8.5. CROSS-CUTTING THEME: DIFFERING VIEWS OF HOW TO TACKLE CC

Differing views of how CC should be dealt with, were expressed by CoCT 1 and 2, alluding to the fact that there are multiple ways to understand, plan and manage CC. Mukheibir et al. (2013, p. 42) discuss what they call *"poorly articulated and inconsistent problem definition and planning response"*, where CCA is inconsistently defined by governmental organisations in Australia. When this is the case, differing views as to how CC and CCA should be tackled become apparent. This is likely to create barriers if these differing views lead to a break down in collaboration between key role-players, competition between differing agendas or exclusion of viewpoints. They are likely to create enablers if they lead to the alignment of adaptation and mitigation (Klein et al., 2007)[89] and enrichment of interventions through the inclusion of multiple viewpoints. As Pelling (2011, p. 165) aptly puts it:

> *Importantly it is in the interaction of different worldviews and priorities established from viewing adaptation through these contrasting lenses* [economy, technology, cultural, social and political opportunities] *that the richness of adaptation policy, potential conflict and scope for coordinated and progressive, sustainable development could emerge.*

This theme relates to knowledge and communication: how CC is understood and communicated, cognition: how CC is perceived, and organisational issues: how the municipality tackles CC. During analysis of the CC documentation it became clear to me that the CoCT took a strong energy/developmental/resource conservation stance in relation to CC. For example, in the Integrated Development Plan it is stated that:

> *by managing our natural resources more efficiently and investing in green technologies, we will ensure that there is enough water and energy to go around, and that we do not generate more waste than is strictly necessary. It is also important that we continue to strive towards a more robust and resilient city that is able to respond to the ongoing challenges of CC and other natural hazards* (CoCT, 2014a, p. 8).

The CoCT's CC focus was also represented by the number of energy initiatives that the city has implemented and plans to implement, as well as the Action Plan for Energy and CC's main goal of energy security (CoCT, 2011b). My literature-based understanding led me to associate this stance with CC mitigation, and when I raised this with CoCT 2 she indicated: *"Ja, I'd say that that is very strong in the Cape Town documentation, but we don't see it as mitigation, we see it as energy security, as better development, as resource management, making the city much more resilient..."* This response from

[89] The in the IPCC's Fourth Assessment Report it is indicated that effective climate policies include a portfolio of adaptation and mitigation interventions (Klein et al., 2007).

CoCT 2 aligns with the understanding that by achieving human development, a community will be more resilient to a more uncertain future, and this reflects the idea of generic capacity (Eakin et al., 2014, see Section 2.3.2.1). Development practices that improve generic capacity focus on "*strategies to address structural differences within a society: inequities in access or availability of health or education services, inadequate income opportunities or disparities in availability of food, water and shelter"* (Eakin et al., 2014, p. 2). This approach is reflected in CoCT 2's explanation of the Clean Development Mechanism funded thermally-efficient low income housing project, which involved retrofitting homes in poor communities with insulated ceilings, energy efficient lighting and solar water heaters (CoCT, 2011b). CoCT 2:

> *It will certainly make that family more resilient… to a variable climate, it's making them resilient to a variable economy, because they'll be healthier, they'll be able to contest in that space better. It'll make them much more resilient to processes, you know, as electricity goes up, or other fuel prices go up, they won't be as vulnerable, because they won't have to heat their homes as much, um, so, I like to talk about resilience to a whole lot of variability, you want people to be able to stand a great range of variability…*

In contrast, CoCT 1 argued that these projects are *"not creating any resilience from a CC perspective, because those people will still remain vulnerable to food insecurity, flooding for most of them because they're situated in vulnerable communities, which are in social housing…"* and *"we remain vulnerable to changing weather patterns no matter what we do from an energy level…"* Hence CoCT 1's view of CC aligns with what Eakin et al. (2014) call improvement of specific capacity, which values risk management and prioritises ensuring that vulnerable populations are able to respond to climate risks such as droughts and floods (Eakin et al., 2014).

These differing views also related to whether priority is placed on tackling CC via prevention (aligned with CC mitigation interventions), or preparing for the impacts of climatic changes (aligned with adaptation). CoCT 2 indicated that:

> *Everything that we work towards should be to prevent CC, you know cure is not going to work, we have to prevent… What it mainly means to me* [referring to CC]*, is like, it's an opportunity for development and development practitioners and for government to really rethink the way in which we do development, and that our development should be primarily about resource efficiency, and about urban centres managing humanity much better… About making sure that, um, ja, that the resources that humanity needs are able to be accessed in urban areas in the most efficient possible way without damaging the climate… That's what urban areas are for, it's for managing humanity in the best possible way.*

Whereas CoCT 1 indicated that despite the CoCT's interventions to reduce greenhouse gas emissions via energy efficiency and renewable energy interventions, there will still be the need to adapt to climatic changes that are built into the system (see Section 1.2). CoCT 1 also felt that more discussion should be held in relation to what level of government deals with what aspects of CC:

> *I would argue that mitigation should be a national agenda, and with regards to CC, local government should be focusing on very much, I mean those interchangeable words: adaptation and resilience. Focusing on preparing for changes in weather patterns and how that impacts or may impact on the socio-economic, environment of local authorities… We are really the receiving environment at the end of the day, if you look at food security, water security, flooding, coastal city, sea level rise, storm surge events, ah, all those kinds of things. At the end of the day the sphere of government that is going to respond to all of that is local government… That's where I think there needs to be a discussion at national level around a better organisation and coordination of how the various spheres of government should be responding collectively to CC and making sure the right focuses are at the right sphere of government…*

CoCT 1 saw a fundamental difference between adaptation and mitigation responses, whereas CoCT 2 indicated that the split between adaptation and mitigation (an approach taken by both the IPCC and the UNFCCC) is *"completely unhelpful. It's destructive, it's undermining..."* Shalizi and Lecocq (2009, pp. 295-296) indicate that *"mitigation and adaptation are not entirely substitutable"*, as mitigation is fundamentally about *"avoiding emissions"* and adaptation about *"coping with impacts"*. Carmin et al. (2012) concur, indicating that at the city scale, adaptation and mitigation measures differ in orientation and emphasis. Mitigation focusing on clean technologies and consumer demand, and adaptation requiring that policies and plans not only deal with emission reductions, but also actions to make cities more resilient and sustainable (Carmin et al., 2012).

Pelling (2011, p. 168) argues that the split between CCA and mitigation, as well as everyday development, is useful in policy terms, but counter-productive in the long-term. Shalizi and Lecocq (2009) motivate for the joint negotiation of mitigation and adaptation policies at the international level, and for joint development and planning of CCA and mitigation at the national level. Reid and Schipper (2014) assert that the best way to help communities deal with CC, is to stop it from happening. They quote Achim Steiner as saying that the *"best form of adaptation is mitigation"* (Reid & Schipper, p. 14). Pelling (2011) argues for adaptation to be seen as an activity that cross-cuts all development actions: *"adapting with CC"*, leading to a situation where CCA may hold different definitions depending on the context within which it is being considered. Ayers and Huq (2008)

indicate that exploiting adaptation and mitigation synergies could assist in bridging the gap between development and CCA priorities in developing countries and the requirement of global engagement in mitigation.

Denton et al. (2014) pick up the scalar issues alluded to by CoCT 1 above. They state that actions at the local level may be limited in relation to both mitigation and adaptation. Regarding mitigation, the local level contributions to global greenhouse gas emissions may be small. Regarding adaptation, there may be limited capacity to adapt to changes at the local level (related to income, education, access to technology etc.) (Denton et al., 2014). Whether adaptation or mitigation approaches are favoured, affects how funding is disbursed and which interventions are implemented (Pielike & Sarewitz, 2005 as cited in Eakin et al., 2014). It can be advocated that it is necessary to improve generic as well as specific capacity, and prevent (aligned with mitigation) as well as adapt to CC. Denton et al. (2014) speak about climate-resilient pathways, which are development trajectories which combine adaptation and mitigation, with the aim of achieving sustainable development. They assert that both adaptation and mitigation are needed, working together, to reduce the risks of CC. However they acknowledge that trade-offs may exist when attempting to achieve both within a certain context. They therefore highlight the need for research to better understand the relationship between adaptation, mitigation and sustainable development (Denton et al., 2014).

As Denton et al. (2014) allude to, although perhaps ideal, the cost and complexity of integrating adaptation, mitigation and sustainable development, poses difficult choices for governments (Fankhauser & Burton, 2011 as cited in Eakin et al., 2014). This is an especially serious challenge for developing country municipalities, where high-level politicians and officials have limited time, limited human and financial resources at their disposal, and limited understanding of new and complex issues like CC. Taylor (in press) states that motivating for the limited political attention and municipal resources available in the CoCT has resulted in detrimental competition between the two CC responses: reducing emissions and dealing with CC impacts. Not everything can be done, and whatever is motivated for most strongly and then championed by high-level decision makers, will be prioritised. This may have ethical implications, as the decisions made manifest in increasing or decreasing the resilience of local communities (Klein et al., 2014). Perhaps a way to deal with these competing priorities is to use a framing, such as social justice (see Section 1.4.3), to prioritise action. Social justice, aligns with local government's goals of supporting the most vulnerable (see Section 8.3.8), and cross-cuts both CC mitigation and adaptation. Hence, whatever is best for social justice (i.e. improving the resilience of the most vulnerable communities), not only in outcome, but in process, will be beneficial for CC and help the CoCT achieve its developmental objectives.

Perhaps in summary I can argue that despite the differing opinions, worldviews and priorities, that are held within the municipal system, between municipalities and other sectors (e.g. business, civil society), and between different government tiers, it would be hard for any one party to deny the fact that the insidious global challenges we face, which includes CC, require an integrated response. A response that considers both generic and specific capacity, and encourages multiple perspectives, is likely to be most beneficial. Development initiatives enabled and implemented by local government, that have been planned by considering their contribution to greenhouse emissions, CC impacts, and societal resilience, are likely to be best for society.

8.6. SOCIAL BARRIERS

8.6.1. Organisational and discursive barriers

Organisational and discursive barriers were discussed in Section 8.5 in relation to: (a) when different views on how CC should be tackled become counter-productive; (b) the need for *"better organisation and coordination of how the various spheres of government should be responding collectively to CC"* (CoCT 1) (also reported on by Taylor, in press); and (c) CoCT 1 alluded to the need for better communication and support from national government, in relation to the challenges that municipalities face in dealing with CC[90]. Mukheibir et al.'s (2013) study of cross-scale barriers in Australian municipalities identified that a lack of consistency in how CCA is governed by the three tiers of government, and lack of communication between these tiers, has meant that CCA has been dealt with in a disaggregated way. Like CoCT 1 alludes to in Section 8.5, they found that the roles and responsibilities in relation to how CCA should be tackled by the three tiers of government were unclear, with local governments often having to take on increased expectations in this regard. This barrier leads to an issue discussed by many of the interviewees across the case studies, i.e. local government officials becoming over-burdened with numerous funded and unfunded mandates (see Section 9.6.1[91]).

Additional organisational barriers include the CC function being placed within environmental departments (see Section 8.7.1.1). Ziervogel and Parnell (2012) and Taylor (in press) discuss how siloisation between departments and sectors hinders the collaboration needed to develop holistic CCA interventions that are sensitive to the multiple interacting challenges that manifest at the community level. Another organisational issue raised by Taylor (in press), is that CoCT officials operate within an environment where reporting on failures may lead to budget cuts, and reporting on successes may lead to additional budget being allocated. Hence, officials often underplay failures and overplay

[90] The code 'lack of national support and leadership' received 5 references.
[91] This is also reported on by Taylor (in press).

successes, which counters the necessary learning-by-doing (sometimes failing) that benefits CCA work (Taylor, in press).

8.6.2. Cognitive barriers

In the CoCT, existing risks that will be overlain by CC, are already overwhelming. This is particularly the case in relation to water issues, such as flooding and sea level rise (discussed further in Section 8.8). A cognitive barrier related to these contextual issues, is that officials felt overwhelmed by CC, as they are unable to cope under present conditions. Linked to this is an issue that represents an overlay between cognitive, knowledge, communication, and contextual barriers, i.e. CC remains intangible until a large CC linked event occurs (aligns with the enabler 'perceiving CC impacts', Section 6.8.8). CoCT 1 emphasised this issue, as is reflected below:

> *It remains intangible, so when we talk about CC impact information and all of these sorts of things, the challenge is even if you get more information, people will still be cynical about the information because no one is able to be absolute. So you are talking about something that is futuristic in many senses. CC in itself is a subtle change, in many people's heads I think they think we will wake up tomorrow and it will be hotter, and it isn't, it's a slow shifting process. Because of that it's not really tangible, and one comment a politician made to me a while back about sea level rise was: I drive past Sea Point every day and I don't see the sea level rising. If he goes tomorrow and it's higher, then he's on board for CC, until that happens, he thinks it's a load of rubbish... We can't feel or touch it at the moment, so we are asking for people to start planning for something that we can't put in a neat box, and that's difficult, particularly in an organisation like this…*

This also links strongly to a barrier that can be classified as both a cognitive and an organisational barrier, in that local government, particularly in developing countries, is often operating within crisis mode, with numerous seemingly insurmountable challenges occurring on a daily basis. Within the hotly contested attention space of high-level administrators and politicians (who make key municipal decisions), major events that can be linked to CC are needed to get CC on the agenda.

An organisational barrier linked to this issue relates to municipalities being structurally and functionally adept at dealing with short-term crises as opposed to long-term proactive planning. This can in fact also be seen as a cognitive barrier, as human beings in general operate better in the short-term. This is encapsulated in the following statement by CoCT 1[92]:

[92] In the feedback session.

> *Local governments are essentially very good at short term planning, very poor at long term planning. The financial systems, the political systems, the political cycles, the budget constraints, the MFMA* (Municipal Financial Management Act), *all of these things are geared up for short term decision making, very badly geared up for long term decision making… CC demands long term thinking and we are better at short term things… Because of the socio-economic pressures on cities we are becoming very efficient at reacting to problems, as opposed to being efficient at preventing problems. Local authorities are building their capacity around - because they've had to - basically operating in a crisis management kind of mode, and crisis management doesn't allow anyone to take a long term view... It's almost institutionalised the nature of the problems that we face at local government level, particularly in an urban environment... CC requires courageous leadership... It requires a special kind of leadership that is able to foresee and plan for 15 years' time... People are preoccupied with just trying to deal with today... The pressures are overwhelming… challenges are almost insurmountable… for most people in the city.... they are kind of like climbing Mount Everests everyday…*

Mukheibir et al. (2013) found the same issue in Australian municipalities, where short political timeframes did not align with the decisions needed for CC, which involve longer term thinking. Policy decisions are easier to implement post a crisis, as opposed to in anticipation of a crisis, despite the fact that from an economic point of view, planning for and avoiding crises is cheaper in the long-run (Shalizi & Lecocq, 2009).

There is thus growing recognition that the way that organisations operate at present deems them unable to deal with the growing global environmental change problems. These challenges are not vested in easily boxed spatial and temporal scales, which can be dealt with effectively using existing governance mechanisms, as expressed by Klein et al. (2014, p. 4):

> *Seizing opportunities, overcoming constraints, and avoiding limits can involve complex governance challenges and may necessitate new institutions and institutional arrangements to effectively address multi-actor, multi-scale risks…*

Making the transition towards the more forward looking responses that are now needed may be a difficult process (Craig, 2010; McDonald, 2011 as cited in Klein et al., 2014), one of the challenges being institutional and organisational inertia.

In the feedback session CoCT 1 also discussed a cognitive barrier that overlays with a knowledge and communication barrier: CC *"has been presented in the last few years as a little bit Armaegeddonish..."* CC communication that is based around fear and major events that then do not eventuate, leads to

people eventually not listening (see Section 3.2.1.4). An example of this is that CC predictions indicate that Cape Town is likely to experience bigger and more frequent winter storms, but CoCT 1 indicated that Cape Town has had four winters with relatively mild storms, hence interest in CC has waned.

8.7. RESOURCE BARRIERS

8.7.1. Knowledge and communication barriers

8.7.1.1. CC as an environmental issue

In the CoCT, CC is seen as an environmental issue, which is reflected in the Integrated Development Plan (CoCT, 2014a, p. 16): *"The environmental challenges that the City faces include the need for CCA and mitigation, conservation of unique natural landscapes or ecosystem goods and services, and dealing with resource depletion"*. Hence, like is the case in most organisations, the CC function is located in the environmental section/department of the municipality, as indicated by CoCT 1:

> *At national level it's DEA* (Department of Environmental Affairs), *at provincial level it's the department of environmental and development planning and at the local level its environmental management, and so it gets located stereotypically with the greenies, that it's a little bit of a fringe element… It's kind of tree-huggerish, and it's not really around service delivery…*

CC has likely been associated with the environment due to the fact that *"climate is part of the natural system... so it kind of evolved from natural scientists and climatologists…"* (CoCT 1). The fact that CC is also most often associated with its physical impacts, which manifest in the environment, is another reason for this association (Moloney et al., 2014). But as Zhang (2009) states, CC is just as much a socio-economic issue as an environmental issue.

The association of CC with environmental issues is a barrier, when environmental priorities are seen as in opposition to government's core mandate of development (see Leck, Sutherland, Scott, & Oelofse, 2011, p. 66 for discussion on the 'environment versus development' discourse in operation in SA; and Pasquini et al., 2014, p. 9 for discussion on how the association of CC with environment, is a barrier to CC progress). CoCT 1 speaking about this issue, said: *"the biggest problem that we have in this country is that CC is located within environmental departments..."* CoCT 2 also mentioned this issue: *"in some ways housing will not like us"*. Florence Almansi speaking at the 7th International CBA Conference[93] indicated that CC being seen as the responsibility of environmental departments is an institutional barrier. Furthermore, Ziervogel and Parnell (2012) utilising a governance lens (Section 1.4.2), discuss this issue as a knowledge and understanding constraint. The association of CC with

[93] See: http://www.iied.org/cba7-highlights-day-two

environmental issues could in fact be seen through the lens of multiple barriers: knowledge and communication barriers, cognitive barriers and/or discursive barriers, and causing organisational and resource barriers, when it leads to CC being located in poorly resourced municipal departments.

In the CoCT (as in all of this thesis' case studies), the environmental department is a middle management department, with limited resources and power, which when combined with limited political buy-in for CCA work (Pasquini et al., 2014; Taylor, in press), leads to adaptation not being prioritised. An example of this lack of prioritisation occurred when technical recommendations from CoCT officials were ignored by politicians, leading to additional coastal infrastructure being built in zones at risk from sea level rise and surge (Taylor, in press). In CoCT 1's opinion if CC was being prioritised adequately, it would be central to the Integrated Development Plan and the CC function would be located in a high-level position within the municipality:

> *The real measure for me around CC at any sphere of government is just to look at the institutional structure… If you've got an IDP* (Integrated Development Plan) *at local level, surely CC must be centrally part of that IDP and if you are serious about that, you would create a position, as part of the IDP office or in the City Manager's office…*

Taylor (in press) argues that for the CoCT's CCA work to be prioritised, a CCA coordination function which exists in the upper echelons of the municipal structure is needed. She indicates that the CCA Plans of Action process (see Section 8.3.7) has brought to the fore, the need for an increase in the CoCT's institutional capacity to enable CCA. Four suggestions are put forward: (a) create a permanent position for a CCA work stream coordinator; (b) create a CC working group, made up of senior municipal staff from across the municipality; (c) develop and maintain strong relationships with research institutes for access to the latest science; and (d) run CC education and communication campaigns across the municipality (Taylor, in press).

8.7.1.2. CC science: difficulty in producing what practitioners want

Other knowledge and communication barriers related to the modelling of CC impacts, and the inherent uncertainty in local-level CC projections[94]. Municipal officials want to know what CC means for their sector and battle to grasp how for example, a 4°C rise in temperatures by 2100 will affect their day to day functions, reflected in this statement by CoCT 1: "*the latest I've heard is that the IPCC is predicting a four degree change, instead of two degrees, and I have no idea what that actually means for rainfall in Cape Town…"* An example of this barrier at play, occurred when a sea level rise assessment was done for the CoCT. There were uncertainties in the modelling, and officials were

[94] The code 'science/ modelling issues' received 5 references in the semi-structured interviews.

unsure how to take account of these uncertainties in their planning, especially when interventions to deal with sea level rise, would incur significant costs. CoCT 1 said:

> *Adaptation decisions are going to require very brave, far-sighted leadership that is willing to make a stand and put their heads on a block, and my experience with politicians is they don't like to do that.*

Reducing these uncertainties was a key recommendation of the 'Framework for Adaptation to CC in the CoCT' (Taylor, in press) (Section 8.3.4), as CC uncertainty does not encourage strong actions, especially when economic interests are involved (Millner et al., 2013 as cited in Jones, 2014). This being said, there are certain inherent uncertainties in the complex process of modelling CC projections that cannot be eradicated; hence Hunt and Watkiss (2011) and Hallegatte (2009) motivate for developing responses that deal with this uncertainty by building flexibility into decision making. Regardless though, the 'newness' of CC as a municipal concern and this uncertainty make decisions to implement CC interventions - bold - as CoCT 1 put it. On the other hand, Taylor (in press, p. 13) argues, that:

> *the lack of certainty and accuracy in CC projections and the distant time horizons are often used as a reason or excuse for delaying investments in climate adaptation when weighed against more immediate and pressing* [needs]*, such as crime, poor public transport and waste management.*

Textbox 8.1 provides a useful example of these knowledge barriers as they overlay with other barriers, in relation to the challenges that CoCT water sector officials face in incorporating CCA into their work.

Textbox 8.1. CCA and the CoCT's water sector (information derived from interactions with CoCT water sector officials at a Climate Services workshop, see Section 8.2)

The CoCT's water sector has taken a leading role in trying to incorporate CCA into its functionality. This due to an early acknowledgement that CC impacts are likely to affect their mandate, which includes maintaining the city's stormwater system functionality to avoid flooding and water pollution. The CoCT's water-related departments operate within the receiving environment of climate and weather impacts, particularly in relation to flood risk, which is already posing challenges for the municipality.

Water sector officials indicated that flooding in informal settlements and densely populated residential areas (often with backyard dwellings) is often worse when rainfall occurs over a number of days, as opposed to short duration events. Cape Town's naturally high water table with perched water systems and poor drainage due to its sandy and undulating topography, exacerbates flooding. Resource shortages hinder the city's ability to deal with this complex problem, with only R 70 million per year being allocated to manage the vast storm water system.

The city has embarked on a climate downscaling exercise and based on this is now planning for a projected 15% increase in rainfall intensity, and sea level rise projections of 600 to 700 mm by 2100.

This is likely to produce no-regret decisions. But in fact, the climate projection timescale most important to city planners relates to the lifecycle of the infrastructure they install: 50 to 100 years. Acquiring this climate information has been difficult, it is both not readily available and if requested, comes with a high price tag. Disagreement between CC models projecting CC impacts for the CoCT has made it difficult for officials to know how to use the science. Other issues relate to the fact that in Cape Town, officials have hours not days to respond to a predicted weather event, due to the nature of the weather systems that affect the Cape. This is further complicated by the fact that catchments in close proximity can experience quite different rainfall and flood impacts, making response decisions difficult. Other challenges are: (a) that the city does not have access to radar data which would produce more accurate future-casts; (b) the rain-gauge network and radio-telemetry that exists for proofing climate modelling is often inaccurate; and (c) there is a lack of capacity for the use of information from the network. An example of these challenges occurred when an early warning system was developed. The inaccuracy of the information and its poor communication led to false alarms being issued and people losing trust in the warnings. Another contested issue is that even if community members are warned, they often do not want to leave their homes, as they fear that their belongings will be stolen.

Cape Town's flooding challenges are complex: knowledge/communication, financial, human resource, cognitive and contextual barriers all overlay. To overcome these barriers will require increased financial, human and knowledge resources. This includes updated information for the rainfall grid, revision of the 15% increase in rainfall intensity value, as well as now-casting and real-time modelling (using radar and rain gauges) to assist planning for rainfall events. What would also be useful, is to gain an understanding of the health related costs of poor drainage and floods in Cape Town, as this could assist in motivating to politicians for the resources needed. Lastly, better coordination of the flow of data and information would improve the situation.

Increased interactions between practitioners and academics would likely assist in overcoming the challenge of producing CC science that practitioners can use. Cartwright et al. (2012) indicated that academics often produce CC information at inappropriate spatial and temporal scales, and often pursue personal or organisational research priorities, as opposed to what practitioners need. The context to which their research may be applied is also not adequately considered, and the research communicated poorly. On the other hand, government officials are often overly focused on day-to-day issues, work within siloes and are reluctant to engage on issues such as complexity (Cartwright et al., 2012). To overcome this academic/practitioner divide, Vogel et al. (2007) advocate for 'boundary organisations', which broker the interactions between the science and practitioner realms. In the CoCT, consultants have often tried to be these 'knowledge brokers', but their limited understanding of the processes on either side of the spectrum (academia and government), has hindered their contributions (Cartwright et al., 2012). For example, a consultant was unable to achieve the objectives of the CCA Plans of Action project (Section 8.3.7), due to lack of local government experience (Taylor, in press).

8.7.2. Human resource barriers

Human resource barriers[95] were discussed by CoCT 1, in relation to the city's CCA work. CoCT 1 spoke about this barrier particularly in relation to the CCA Plans of Action programme (Section 8.3.7) which has required a significant investment of human resources and time, both of which have often been lacking. The CCA Plans of Action process has been particularly resource intensive because it has been driven by one department (the Environmental Resources Management Department, CoCT 3: *"if it doesn't get driven more by the environment department, they will fall by the wayside..."*), which is trying to influence many other sectors within the municipality. Advocating the importance of incorporating CCA into sectoral plans and developing plans of action with sectors, has required a significant investment of human resources, which have been in short supply. Mainstreaming CCA within a municipality is a slow process, as CoCT 1 indicated: *"it's like turning a big tanker at sea, it's incremental and slow, and you have got to keep chipping away at that…"* The human resources for the city's adaptation work is likely to be alleviated slightly though; CoCT 1 indicated (during the feedback session) that an additional staff member, who will focus on CCA and the CCA Plans of Action, will be joining the municipality shortly.

8.7.3. Financial barriers

Financial barriers were discussed briefly in relation to the procurement system and how it slows down project implementation, but were not emphasised. CoCT 2 said: *"We feel very challenged by the whole supply chain management system and our big sort of focus in a way, is trying to get the city to see that you need these innovation teams inside supply chain management…"* Taylor et al. (2014) indicated that due to the CoCT's finance department's conservative interpretation of the Municipal Financial Management Act, the kind of innovation that CoCT 2 spoke about, is difficult to enable. Budget constraints were discussed by sector representatives during the CCA Plans of Action process (see Section 8.3.7), as no new budget was made available for the implementation of adaptation interventions. Therefore, unless actions that were budgeted for anyway could be linked to CCA Plan of Action interventions, money did not exist for their implementation (Taylor, in press). CoCT 1 indicated that CCA funding in general has been difficult to come by, with funding garnered via the partnership between the municipality and the University of Cape Town having enabled CCA research, as opposed to implementation.

[95] 'Human resource barriers' received 5 references in the semi-structured interviews, all from CoCT 1.

8.7.4. Technology barriers

Technology barriers were mentioned by CoCT 2 in relation to the planned roll-out of solar water heater technology, as opposed to having been experienced: "*I think they're quite happy to get the technology, my biggest worry is that solar water heaters won't be good quality…"* Concerns relating to technology, as expressed by CoCT 2, form part of the motivation for a large staff complement to monitor and evaluate the city's energy projects.

8.8. CONTEXTUAL BARRIERS

The CoCT faces significant challenges relating to flooding, sea level rise, fires and drinking water shortages, all of which are expected to worsen under CC conditions[96]. Taylor (in press, p. 2) states that:

> *there are numerous signs to suggest that Cape Town is far from being well adapted to the range of climate conditions currently in the city, let alone adapting well to how climate conditions are expected to change in the future.*

These climatic challenges are overlain with socio-economic problems, such as unsustainable levels of in-migration: *"there is a lot of migration to Cape Town seeking better opportunities…"* (CoCT 1). Due to the city's lack of uninhabited land, these mostly poor individuals settle on high-risk, un-serviced areas. This urbanisation also affects the natural systems which help to buffer CC impacts for all city residents (Bahadur & Tanner, 2014). Poor people living in informal settlements in cities like Cape Town, are highly restricted in what they can do in response to climatic changes and hence are likely to bear the brunt of CC impacts. CoCT 1 said:

> *One of the key challenges that we face, around adaptation… we have with all the informal settlements in the Cape, people moving to vulnerable areas, and those areas are where no one is living currently, and the reason why no one is really living there, is generally it is a wetland or a flood plain or something…*

CoCT 1 discussed how vulnerable those that migrate into the CoCT are (they migrate from surrounding rural areas and peri-urban areas; Apartheid planning placed black South Africans outside of the city centre, and away from economic opportunities; see Landman [2010]). CoCT 1 indicated that those that migrate to the CoCT to live in informal settlements, are poor, lack access to basic services (e.g. sanitation), and live in unsafe structures (shacks made of plastic and wood), in unsafe areas (see Section 3.4 and Landman [2010] who discusses these issues). They are vulnerable to extreme weather events and runaway fires. Emergency vehicle and personnel access is also hindered as the informal structures are built close together. These challenges are exacerbated by the fact that Cape Town has

[96] The code 'vulnerability to existing climate' received 5 references in the semi-structured interviews.

cold, wet winters, which worsen health issues such as tuberculosis and HIV/AIDS. Cape Town also has a high water table, which worsens flood impacts; communities living in these vulnerable areas are affected by flooding annually. CoCT 1 explained that their responses are reactive, e.g. they place their beds on bricks and build informal bridges between their homes.

CoCT officials tend to respond reactively when crises occur in these informal settlements, by providing disaster relief post flooding. CoCT 1 indicated that this reactive response is contributed to by government being better equipped for reactive, as opposed to anticipatory responses (discussed in Section 8.6.2). This being said, it is stated in the CoCT's Integrated Development Plan that the city's Disaster Risk Management Centre will provide awareness-raising for 'at risk' informal settlement communities in relation to fires, floods and CC (CoCT, 2014a), which is a form of anticipatory action. CoCT 3 indicated, that although disaster risk management, requires reacting on a day to day basis in response to events, the city's disaster risk management sector is attempting to reduce risks in a more proactive way. In fact, the city's disaster risk management sector has been an ally to the Environmental Resource Management Department during the CCA Plans of Action process (Taylor, in press).

To deal with the challenge of communities located in high risk areas of the city, the CoCT needs to provide safe housing that is located close to economic opportunities. However, CoCT 1 indicted that there is a housing shortage of 400 000 houses, with 15 to 20 000 people moving into the city per month, and the city is only able to deliver 12 000 houses per year under the current housing model. Who gains access to limited open land, close to the city centre, is also contentious. Private organisations could boost the city's coffers significantly by paying high property rates, but poor communities require safe accommodation close to opportunities (this competition over land in SA is discussed by Landman [2010]). CoCT 1 said:

> *We've got 200 000[97] informal settlements that are flooded every winter and we've got nowhere to put them, we can't move them, they won't go, and there's just more coming, and the places that they are filling in is all of those vulnerable spaces, because we haven't developed those spaces for a reason to date, generally is they're in a flood plain, they're in uninhabitable land, or in theory uninhabitable land...*

These existing contextual challenges, when overlain with CC challenges (CC projections indicate an increasing number of extreme rainfall events in the future, and decreased overall rainfall, leading to increased frequency of fires [Mukheibir & Ziervogel, 2006]), make the challenges seem even more insurmountable. Ziervogel and Parnell (2014, p. 65) described this situation as *"an unmanageable*

[97] I am not sure whether CoCT 1 was referring to 200 000 informal settlement households or to 200 000 informal settlements.

objective", where the CoCT operates in a *"crisis manner"* (Ziervogel & Parnell, 2014, p. 65). The contextual barriers discussed above are particularly important in relation to social justice, as those living within informal settlements and vulnerable areas in the CoCT have limited options to deal with CC impacts, which are set to exacerbate present conditions. The principles of CBA would be well suited to these types of situations, where it is clear that top-down interventions are not solving the problems at hand. On-the-ground interactions with these vulnerable communities to better understand their motivations for living in these highly vulnerable areas, as well as their concerns and needs, would likely improve the potential of a more long-term and sustainable plan of action. These communities have developed ways to cope, albeit insufficient, e.g. building bridges between their homes. Learning from and building on these coping mechanisms, may lead to viable adaptation interventions.

Another contextual barrier in the CoCT relates to its coastal infrastructure, which is under threat, as it is built too close to the existing high water mark. At present this infrastructure incurs high maintenance costs (e.g. Baden Powell Drive), which are likely to increase under CC conditions. CoCT 1 explained that when the sea level rise assessment (Section 8.3.5) findings were made public, concerned residents contacted the city to query whether they should relocate. Providing advice to residents on this issue was challenging, because as was discussed in Section 8.7.1.2, CC projections at the local level are uncertain and interventions in response to projections (e.g. relocate) are costly.

Further contextual issues were raised by CoCT 1 in the feedback session. The first relates to the politicised nature of municipalities post 1995. CoCT 1 indicated that the municipal space has become more complicated post 1995 and particularly 2000. Prior to 1995, municipalities in SA were run primarily from a technical and administrative perspective. Now they are highly politicised, with the municipality's core mandates being determined by the incumbent political party, and all municipal decisions being affected by political interests (Keen et al., 2006 as cited in Pasquini et al., 2014). A municipality's functions have evolved since 1995, from just technical service delivery, to taking on additional functions that align with political agendas (which relates, in part, to EM 1's discussion in Section 6.5.1.1). Hence, municipal officials have multiple functions and operate within a complex environment, where high level administrators and especially politicians, play a significant role in enabling or hindering the institutionalisation of the CC agenda (Pasquini and Shearing, 2014). A further challenge exists in that politicians tend to prioritise interventions with short term 'wins' that contribute positively to their re-election, which runs counter to the long-term visionary leadership that CCA needs (discussed by Pasquini & Shearing [2014], as well as in Section 7.5.1.4). The second issue that CoCT 1 raised was that certain interventions in the CCA Plans of Action are simply not feasible in the CoCT context. He indicated that certain interventions, like increasing stormwater pipe sizes by 15% (see Textbox 8.1) are manageable. Whereas others, such as placing a moratorium on

building homes in flood plain areas are difficult to enact as *"there is nowhere else, and people have moved onto the land, and won't move off it... Some of the stuff we would like to do, is just not possible…"* (CoCT 1).

8.9. ENABLERS

Enablers were expressed far more readily by CoCT 2 then CoCT 1, which is reflected by the significant progress that the energy security work has made. This work was given increased priority during and post the rolling black-outs of 2008, focusing attention on the need to ensure Cape Town's energy security. Both the adaptation and mitigation work has benefitted from the city's strong partnerships with local universities, NGOs and consultants, which bolster human resources. The ability to garner external funding and supportive leadership are two enablers that have been important for the energy security work.

8.9.1. Partnerships and networks

The CoCT has access to world-class academic and research institutions, as well as leading NGOs and consultancy companies, whose expertise and knowledge can be drawn on via formal (contracting their expertise to the municipality) and informal (interpersonal networks) arrangements. This enabler is reflected in the CoCT's Action Plan for Energy and CC (Section 8.3.6), where strong partnerships with Sustainable Energy Africa (an NGO), universities, Eskom, the South African Cities Network and provincial government are highlighted as important enablers of the work to date (CoCT, 2011b). A CC Coalition was also formed in 2011, which brought together businesses, NGOs and academia, to run the city's Climate Smart campaign[98] and showcase Cape Town's CC work at COP17 (Taylor et al., 2014).

An example of a more formalised partnership exists between the University of Cape Town's African Centre for Cities and the CoCT. In 2012 a Memorandum of Agreement was signed between these two organisations to collaborate on the MISTRA Urban Futures Knowledge Transfer Project (CoCT, n.d). The aim of the project is to ensure knowledge sharing between the two institutions in relation to certain identified research areas, which include CC policy and urban resilience and sustainability. In reality what this partnership enabled is the *"secondment of ACC* [African Centre for Cities] *researchers into the local government administration, as well as giving government officials a reciprocal opportunity to take a writing-sabbatical at the university"* (Taylor, in-press, p. 4). The CC Think Tank and the CCA Plans of Action project have both benefitted from the municipality/university partnership, where researchers and city officials have co-produced knowledge together. The CC Think Tank was not enabled by legislation, national direction or local government

[98] The campaign promoted CC literacy and awareness raising within the city.

mandate, but by a few key individuals from the CoCT, Western Cape Provincial Government, University of Cape Town and a local NGO. These individuals recognised the importance of such a partnership and had the networks and influence to enable it (Cartwright et al., 2012). The CCA Plans of Action project has benefitted from one of the MISTRA researchers documenting the process of its development, and investigating the barriers and enablers of the process to date (see Taylor, in press). This kind of work is essential in ensuring that the lessons learnt are acknowledged and built upon by present and future CCA staff within the CoCT.

In relation to inter-departmental collaboration, the CCA Plans of Action project has increased municipal sector representatives' knowledge of CC and their ability to identify opportunities for collaboration across different sectors (Taylor, in press). CoCT 2 indicated that inter-departmental collaboration occurs in relation to the energy security work, e.g. during the electricity saving campaign with the electricity department, and with the housing department during the retrofitting of ceilings programme. Discussions with the finance department are now being taken forward in relation to supply chain management issues, and the revenue loss that certain energy interventions cause. CoCT 1 indicated that the finance department is supportive of initiatives that will save the city money by reducing the municipality's consumption of electricity, but opposed to initiatives that will reduce the sale of electricity to consumers (because of the vital role that revenue from electricity sales plays in balancing the city's budget). Inter-governmental collaboration between the CoCT and the Western Cape Provincial Government is represented by the joint energy action plan and the Green Cape Initiative[99], with regular meetings being held between the two tiers of government (CoCT, 2011b).

8.9.2. The ability to garner external funding

International funding has played a key role in enabling the CoCT's energy security and CC work to date. Funding for the CC work has been received from DANIDA, the IDRC and SIDA[100] to name but a few (Cartwright et al., 2012). The CC Think Tank has been enabled by international funding (DANIDA, British High Commission and MISTRA Urban Futures), with a second tranche of funding being secured in 2013 for phase two of the initiative (Taylor et al., 2014). Gaining external funding has occurred because city officials have been able to identify funding opportunities (via good networks) and to develop successful proposals, as well as due to the city's links with the University of Cape Town, which can facilitate access to significant external funds.

[99] See: http://green-cape.co.za/

[100] Denmark's development cooperation (Ministry of Foreign Affairs of Denmark), the International Development Research Centre, and the Swedish International Development Cooperation Agency.

Through pilot funding, the CoCT has been able to demonstrate the implementation of successful energy security projects, bolstering the city's reputation, which increases opportunities for additional funding. The ability of the energy work to save the city money through reduction of the municipality's energy consumption as well as cutting household expenditure (e.g. by installing a solar water heater), has assisted in making an economic argument for the energy security work. However, as indicated above, there is a tension in the municipality instituting initiatives that reduce household consumption of electricity, as the sale of electricity is a source of income for the municipality. The numerous awards[101] that the city has won in relation to its energy security work, has assisted in the successful motivation for additional staff, thus overcoming human resource barriers. These awards increase the profile of the city's energy security work and provide impetus for high-level officials and politicians to become more familiar with this work, which contributes to 'supportive leadership' (Section 8.9.3).

8.9.3. Supportive leadership

The energy security work has benefitted from departmental leadership that allows the flexibility needed to pursue innovative projects, as indicated by CoCT 2:

> *Our director, he's a real champion, um, who is also completely ego-less, so um, he is a big supporter… He really lets you have enough freedom to do what you need to do, he's not a micro-manager at all, he's always very interested in the work and I think he is a very big supporter of our work…*

The municipality's good reputation with citizens, especially the middle to upper class within the CoCT, assists in uptake during energy and CC awareness campaigns. CoCT 2 said: "*Because the city seems, with the high earners, to be a voice of authority, 'yes this is fine', or whatever. So the city has got a good reputation, in the low income communities it is much more varied…"*

High-level buy-in for the city's CC and energy security work is reflected in the formation of high-level political and administrative bodies, i.e. the Section 79 Energy and CC Committee (which includes city councillors) and the Energy and CC sub-committee[102] (which includes high levels officials within the CoCT's Executive Management Team). The main focus of these committees has been the renewable energy and energy efficiency aspects of CC (Taylor, in press). Political buy-in has been attained by officials making the argument for the importance of this work (as opposed to the politicians *"driving*

[101] For example, Cape Town was named the Global Earth Hour City Capital for 2014 by the World Wide Fund for Nature in recognition of the city's innovative CC actions and sustainable urban environment initiatives (CoCT, 2014c).

[102] CoCT 1 indicated during the feedback session that the high level administrative body for energy/CC has faced significant challenges due to disputes over the sale of electricity to increase municipal income versus reducing energy consumption, which aligns with the city's energy security goals.

the agenda" [CoCT 3]), by the city winning awards and the multiple benefits that the energy security projects have provided. In relation to CCA specifically, significant climatic events increased attention in relation to potential CC impacts, and assisted in engaging key individuals in the CCA Plans of Action process (Taylor, in press).

8.10. RELATING THE BARRIERS AND ENABLERS DISCOVERED TO CBA

No specific community level CCA project was examined in the CoCT case study. This is because the municipality's CCA work has centered on municipal-level interventions, such as the CCA Plans of Action. This being said, the contextual barriers discussed in Section 8.8 alert one to the significant community-level challenges that exist in the city (i.e. flooding and fires in informal settlements). Dealing with these challenges has faced significant barriers relating to: (a) the reactive and top-down fashion with which the municipality operates; and (b) the reality and perception of the day-to-day challenges as overwhelming (especially when overlain with knowledge of CC impacts), which counters action. Human resource constraints and the fact that municipal scale interventions have been favoured to date, has hindered the ability of the municipality to engage with CBA. This is despite the fact that, as discussed in Section 8.8, CBA may provide a useful toolbox for the municipality (likely in partnership with others) to tackle the significant contextual challenges. CoCT 1 discussed the fact that the municipality does not have a clear CCA position, which is a key barrier to the CCA work: *"the biggest weakness in Cape Town is that we don't have a formal position for CCA…"* Gaining the political and administrative will and support to develop a CCA position for the municipality, will likely involve politicians and officials investigating the various ways to enable CCA (e.g. Ecosystem Based Adaptation[103], CBA) and then deciding on a way forward, which may or may not include CBA as a municipal intervention. The fact that city officials have such strong networks with researchers and NGOs means that (like was the case in EM and CHDM) there is the potential for partnerships to enable community-level work, despite human resource constraints at the municipal scale.

A final point to make in this section (in relation to Section 8.5), is that different approaches to dealing with CC in the city, need to be brought together. The energy security work of the municipality has made significant progress; multiple energy-saving campaigns have been run and multiple energy efficiency and renewable energy interventions implemented. Building on these successes, to include consideration of interventions more traditionally couched within adaptation, such as food security and flood prevention, while taking CC projections into account, could be seen as a useful way forward.

[103] Ecosystem Based Adaptation is a particularly useful approach in developing country contexts, due to the fact that: (a) it improves ecosystem goods and services that communities often rely on more directly; and (b) the actions are often more cost-effective than physical engineering options (Devisscher, 2010).

The key enabler of 'partnerships and networks' could also be expanded, and it would be useful for institutions, such as the CC Think Tank, to continue the co-production of knowledge, focusing on new areas of investigation (the initial foci of the CC Think Tank were energy, coastal impacts and legal imperatives for CC). In summary, there is far more in favour of the CoCT progressing its CC work, than against it. The municipality is well-run administratively, has a strong economy and therefore has access to resources, officials have good networks, and the city is seen as a CC leader in SA. All of these advantages though do not mean that CBA will be planned and implemented. CoCT 1 indicated in response to a question on whether municipalities should enable CBA that:

> *The key interventions that local government can do is at that large scale around planning utilities, water security, food security, it's making sure at that level we are making the right decisions, and we are being proactive around it… which ultimately reduces the risk for communities…*

CoCT 1 also indicated that a lot of work is being conducted in the CoCT at the community level (by NGOs, researchers and government), but better integration of this work is needed. Hence, one way that CBA could be planned and implemented in the CoCT, is for municipal officials, such as CoCT 1, to realise the value of the municipality engaging in CBA; leading to the municipality engaging, enabling and coordinating the community-level work being conducted in the municipality.

CHAPTER 9: NELSON MANDELA BAY MUNICIPALITY

9.1. INTRODUCTION AND BACKGROUND TO THE CASE STUDY

Nelson Mandela Bay Municipality (NMBM) governs the NMBM area, which includes the city of Port Elizabeth and surrounding areas (see Figure 9.1). The socio-economic and ecological challenges listed in Table 9.1 will be exacerbated by CC impacts. Of particular concern are issues related to water, as population numbers are expected to increase and CC predictions indicate a drying trend (SRK, 2010). Water shortage challenges in the municipality will not only have implications for human consumption of water, but will also affect NMBM area's biodiversity. Two biodiversity hotspots converge in the NMBM area (the Cape Floristic Kingdom and the Maputo-Pondoland hotspot), where seven of the nine South African biomes can be found (NMBM, 2014c).

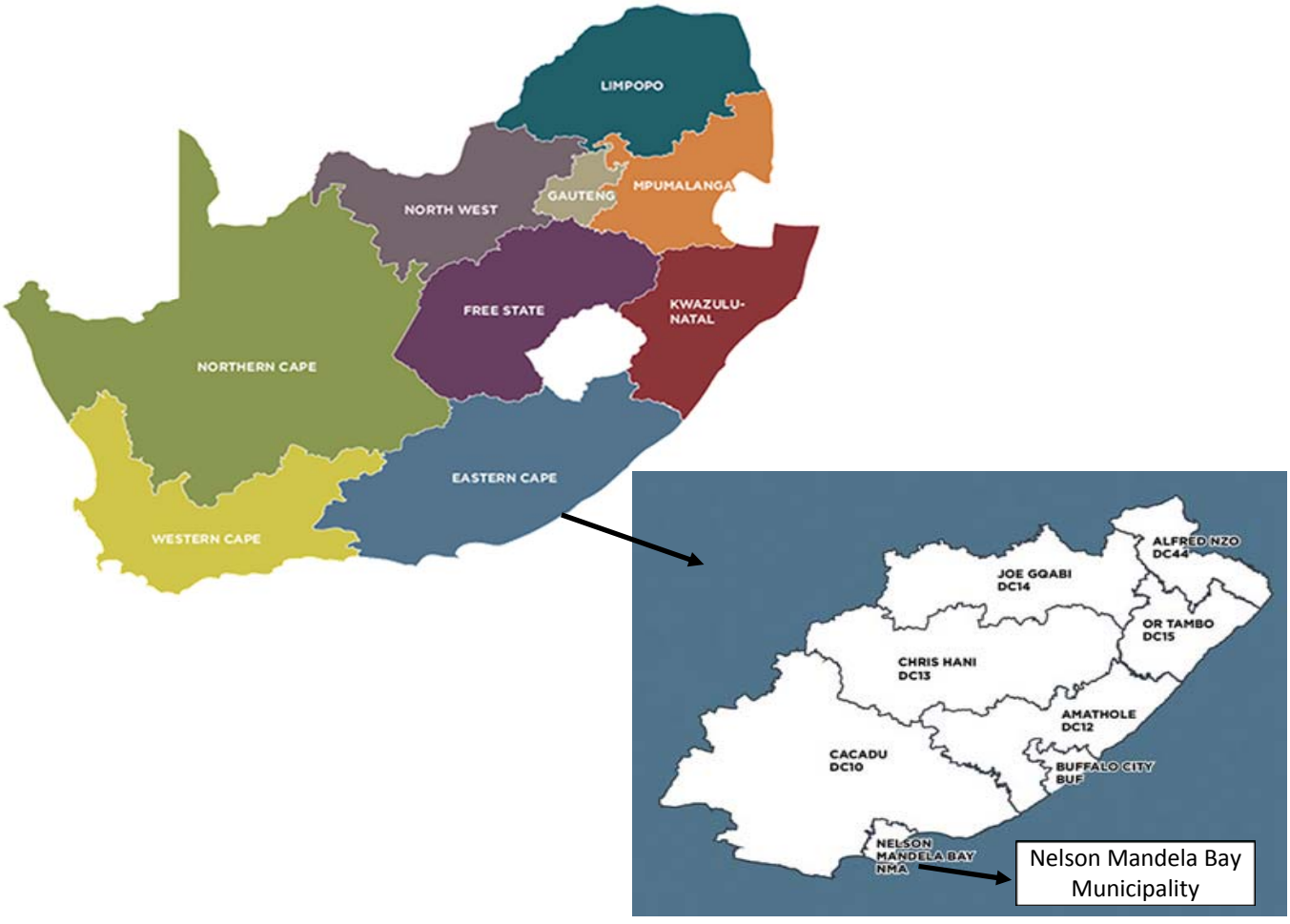

Figure 9.1. Map indicating NMBM's locality within SA (images from the Local Government Handbook, 2015)

Table 9.1. Contextual information relevant to NMBM

Type of municipality	Metropolitan
Main city/town(s) governed	Port Elizabeth, one of the two major cities (East London) in the Eastern Cape.
Size of area under municipal jurisdiction	Nelson Mandela Bay Municipal area = 1 950 km^2 (NMBM, 2013)
Rural/urban split	The NMBM area is mainly populated by residents living in urban and peri-urban areas. This information was garnered from discussions with NMBM 1, as it is difficult to attain data on rural/urban split as StatsSA no longer reports on this distinction (StatsSA, 2008).
Budget and economy	• The budget for the 2014/2015 financial year is R 8.1 billion (NMBM, 2014b). • The economy of NMBM is based to a large extent on its port's operations, the Coega Industrial Development Zone and its large automotive industry (ECSECC, 2011).
Social, economic and ecological challenges (from NMBM, 2012a)	• High levels of poverty and unemployment. • Inadequate access to basic services. • Infrastructure, maintenance and service delivery backlogs. • High levels of HIV/Aids (30.8% prevalence rate according to Antenatal Care Statistics). • The biodiversity of the NMBM area is threatened by both developmental and CC impacts (NMBM, 2014c).
CC predictions (from SRK, 2010)	The Disaster Risk Assessment Report (SRK, 2010) indicated that CC will increase all of the risks that the NMBM area faces. Especially in relation to CC predictions, which include: • Drying and warming of the climate. • Increased extreme weather events (including droughts and floods). • Improved conditions for malaria and heat waves. • Sea level rise.

9.2. SPECIFICS OF METHODS

A pilot discussion was held with NMBM 1 (see Table 5.3) on the 10th of July 2012, where background to the municipality's CC work was discussed, documents related to this work sourced, and discussion held as to who was involved in the CC work of the municipality. Analysis of the sourced documents informed the in-depth discussions held with NMBM 1 on the 11th and 12th of September 2012, the semi-structured interview with NMBM 1 and 2 on the 11th of September 2012, as well as the semi-structured interview with NMBM 3 on the 12th of September 2013. On 30 May 2014, discussion was held with NMBM 4 in relation to NMBM's CC work, and a feed-back session was conducted with NMBM 1 on 7 June 2014 (see Section 5.7). I also attended a presentation by a NMBM employee on 9 September 2014, which was entitled 'Responses from the Nelson Mandela Bay Municipality through various interventions across directorates which address CC issues'. I had analysed my NMBM data by this time, and hence this presentation offered a further opportunity for verification of my findings.

9.2.1. Methodological considerations

My main contact for this research NMBM 1, has not been an employee of the municipality since the end of 2010, although NMBM 1 continued to work with the municipality on CC-linked initiatives as a consultant. NMBM 1's experience working within the municipality and with municipal staff as a consultant proved useful, as both these roles added perspective to NMBM 1's understanding of the barriers and enablers at play. As indicated in Section 5.7, I found it difficult to identify an expert, who had conducted work with the municipality in relation to CC, with whom I could discuss my findings. I discovered at a CCA conference that ICLEI[104] had done some work with NMBM on CC linked initiatives and hence discussed this work and my findings with NMBM 4 as a form of verification of my findings.

9.3. CONTEXTUALISING THE CASE STUDY: THE EVOLUTION OF NMBM'S CC POLICY AND PRACTICE

The evolution of NMBM's CC work was explored via desktop analysis and discussions with interviewees, with key milestones reflected in Figure 9.2, and listed with brief descriptions in Sections 9.3.1 - 9.3.8. Barriers and enablers related to this evolution are incorporated in Sections 9.5 - 9.9.

- **(a) 2008:** The **Go Green Campaign** is launched.
- **(b) 2010:** The **Disaster Risk Assessment Report** and the **Disaster Management Plan** are produced.
- **(c) 2011: COP17** hosted by SA, attended by NMBM staff and CC events hosted in NMBM.
- **(d) 2012:**
  - **Climate Response Guide for NMBM** developed.
  - **Coastal Setback Lines Draft Report for NMBM** developed.
  - **Integrated Environmental Policy** produced.
- **(e) 2013: Climate Response Status Quo Report** developed.

Figure 9.2. Timeline of selected CC milestones in NMBM

9.3.1. Go Green Campaign

In 2008 the 'Go Green Campaign' (Figure 9.2[a]) was launched. The aim of which was to raise awareness and educate the residents of NMBM with regards to the environmental and CC initiatives that the municipality was undertaking, as well as how they can become green themselves (Afri-Coast Engineers, 2013). This campaign received a boost when, in alignment with NMBM hosting a leg of the 2010 FIFA™ Soccer World Cup, responsible and greening tourism strategies were developed, and

[104] ICLEI is a not-for profit global association of local governments who are committed to promoting sustainable development (Mukheibir et al., 2013, p. 25).

NMBM's World Cup stadium was built in a sustainable fashion (implementation of an Environmental Management System[105]). Blauw (2014) indicated that in 2013 to reinvigorate this campaign, a 'Go Green Advocacy Campaign' was rolled out, where door to door advocacy work was conducted by the municipality to make the public aware of ways in which they can become greener, e.g. by saving water and electricity, which will have positive CC ramifications.

9.3.2. Disaster Risk Planning

A Disaster Risk Assessment Report (Figure 9.2[b]) was produced in 2010, where CC interventions were recommended (SRK, 2010). These included: (a) hard infrastructural interventions (e.g. quays, wharfs and breakwater structures); (b) soft infrastructural interventions (e.g. ensure adequate health services); (c) the development of policies and plans (e.g. set-back lines, infrastructural maintenance plans); and (d) education (e.g. on how to diversify livelihoods) (SRK, 2010). Municipal staff involved in the production of the risk assessment perceived that the drought being experienced at the time was linked to CC, however the uncertainty of CC science (discussed in the assessment report), is likely to influence whether this perception leads to CC action. NMBM's resource challenges are also articulated in the disaster risk assessment report, as staff and funding received the lowest resilience ratings by all directorates (SRK, 2010). A Disaster Management Plan (Figure 9.2[b]) was also produced in 2010, but only discussed climate variability or change in two places: (a) in relation to all municipal departments being required to consider climate variability when planning for disaster risk reduction; and (b) sea level rise was listed as a hazard for the municipality (NMBM, 2010).

9.3.3. COP17

During 2011 SA hosted COP17, which a number of NMBM staff attended (Figure 9.2[c]). It also stimulated a number of events, including a CC response seminar (17 November 2011) and a COP17 Feedback Session (22 March 2012) (NMBM, 2014c). NMBM is also a signatory of the Durban Adaptation Charter, which was launched at COP17 (see Section 6.3.3).

9.3.4. Climate Response Guide for the NMBM

During 2012, a climate response guide (Figure 9.2[d]) for the NMBM was developed as a means of ensuring that the CC knowledge garnered between 2009 and 2012 was recorded and could be drawn upon if and when NMBM was able to hire staff directly responsible for CC response. The 'Climate Response Guide for the NMBM: Guidelines towards the integration of climate response interventions

[105] See: http://www.nmbt.co.za/responsible_tourism.html and http://www.nelsonmandelabay.gov.za/Content.aspx?objID=412

within current activities, priorities and budget' (Afri-Coast Engineers, 2012) aimed to assist directors (middle management) within the municipality in incorporating CC into their sub-directorate's day to day functioning. This initiative is similar to EM's Municipal Adaptation Plans and the CoCT's CCA Plans of Action (see Sections 6.3.4 and 8.3.7). Nine of the municipality's directorates[106] were consulted to gain an understanding of their present and potential CC work. Although useful in documenting current CC work, and as a baseline document that could be built upon, potential interventions have been slow to be implemented. The slow uptake of these recommendations may be a result of: (a) the suggested CC tasks not aligning with the indicators used to monitor municipal performance, leading to a lack of incentive to tackle them; (b) the difficulty that under-resourced sub-directorates face in trying to institute something new; and (c) the lack of a municipal department/unit with the necessary human resources to drive the initiative.

9.3.5. Coastal Setback Lines Draft Report

Also during 2012, a 'Coastal Setback Lines Draft Report' (Figure 9.2[d]) was developed in response to national legislation mandating municipalities to develop coastal set-back lines that take CC into account. NMBM's set-back lines were developed based on an assumed 1 m sea-level rise by 2100 and were delineated 100 m from the high-water mark, thus they only take physical processes into account. This broad-brush approach has led to a disclaimer, where the report suggests that the lines only be applied when more specific information is available (Masande Consultants & Afri-Coast Engineers, 2012).

9.3.6. Integrated Environmental Policy

The Integrated Environmental Policy (Figure 9.2[d]) discusses CC under its vision, which includes: *"a society acknowledging the challenges of CC and accordingly prioritises renewable energy generation and efficient consumption thereof"* (NMBM, 2012b, p. 5). The policy also indicates that to deal with CC (proactively[107]) the municipality endeavours to: (a) establish the necessary structures and capacity; (b) improve CC awareness; (c) play its part in fulfilling SA's international and national commitments to CC; (d) promote energy efficiency and 'low carbon' practices; and (e) plan effectively for sea level rise (NMBM, 2012b). The Public Health Directorate's (Environmental Management Sub-Directorate) role in enabling the municipality's CC response is confirmed in this document, as it is tasked with producing, maintaining and implementing a CC and Response Management Strategy (NMBM, 2012b).

[106] Budget and treasury, chief operating office, corporate services, economic development and recreational services, electricity and energy, human settlements, infrastructure and engineering, public health, and strategic programmes.
[107] See Section 9.5.2.

9.3.7. Climate Response Status Quo Report

In 2013 a 'Climate Response Status Quo Report, a summary of the NMBM climate response work for the period 2009 – 2013', was produced (Figure 9.2[e]). The report highlights the challenges faced in trying to mainstream CC within the NMBM, and documents lessons learnt in relation to the CC work from 2009 - 2013. The report confirms that much of NMBM's CC work is still within the understanding phase of the CCA process (Moser & Ekstrom, 2010, see Section 3.3.1), as the *"climate response work has not yet been translated into policy or concrete strategies and plans"* (Afri-Coast Engineers, 2013, p. 1). Specific mention is made of the fact that although the temperature in the NMBM area has been higher in the last decade, when compared to the long-term average, it cannot be statistically proven to be due to CC (Afri-Coast Engineers, 2013).

9.3.8. The Integrated Development Plan

NMBM's CC work to date has focused to a large extent on renewable energy and energy efficiency (see Section 9.8.2). The municipality has initiated a number of energy efficiency projects: (a) a large solar water heater pilot project (NMBM, 2014a); and (b) a Renewable Energies Pilot Project, where small-scale decentralised grid renewable energy is being promoted (NMBM, 2014d). Even the NMBM's Environmental Policy prioritises renewable energy generation and the efficient consumption thereof (NMBM, 2012b, p. 5). In the Integrated Development Plan (NMBM, 2014a), CC is discussed under the electricity services section, where carbon emission reduction and CC mitigation is motivated for, in response to SA's need to reduce electricity consumption. CC is also discussed under the public health services section, in relation to dealing with environmental and CC impact challenges. The latter section houses discussion on the Integrated Environmental Management Plan (Section 9.3.6) and a CC Response and Adaptation Plan (NMBM, 2014a). The Integrated Development Plan also indicates that a unit to manage air quality and CC will be established in the 2014/15 financial year due to the fact that *"CC is considered as potentially the most serious threat to humanity and sustainable development, with adverse impacts expected on food and water security, economic activity, human health, physical infrastructure and natural resources"* (NMBM, 2014a, p. 300). Along with this unit, the development of a CC Response and Adaptation Plan is aimed for, which will require that a greenhouse gas emission inventory and vulnerability assessment is conducted (ICLEI has committed to assist NMBM in this endeavour) (NMBM, 2014a).

In relation to the social justice lens of this thesis, the Integrated Development Plan documents goals to improve the lives of the municipality's poor communities. Interventions to: (a) assist those with HIV/Aids; (b) improve food security; (c) create employment opportunities, especially for the youth; (d)

empower women, with a focus on gender equality and equity; (e) protect orphans and vulnerable children; and (f) prioritise previously disadvantaged communities, are documented throughout the plan (NMBM, 2014a). These social justice issues are not discussed specifically in relation to CC, but their implementation will improve generic adaptive capacity (see Section 2.3.2.1) of NMBM communities. What perhaps would be a useful way forward would be for these issues to be linked to the CC concerns that the municipality has; the value of CBA is then likely to also become apparent, as its core principles deal with both CC concerns and broader developmental and social justice issues (see Section 2.4).

9.4. KEY BARRIERS AND ENABLERS IDENTIFIED

Figure 9.3 provides an overview of the barriers and enablers identified in NMBM, which are explained further in Sections 9.5 - 9.9. Resource barriers were expressed as the most significant constraints to municipal CC work by interviewees, but I found that organisational, cognitive and normative barriers played a role in causing many of these resource barriers.

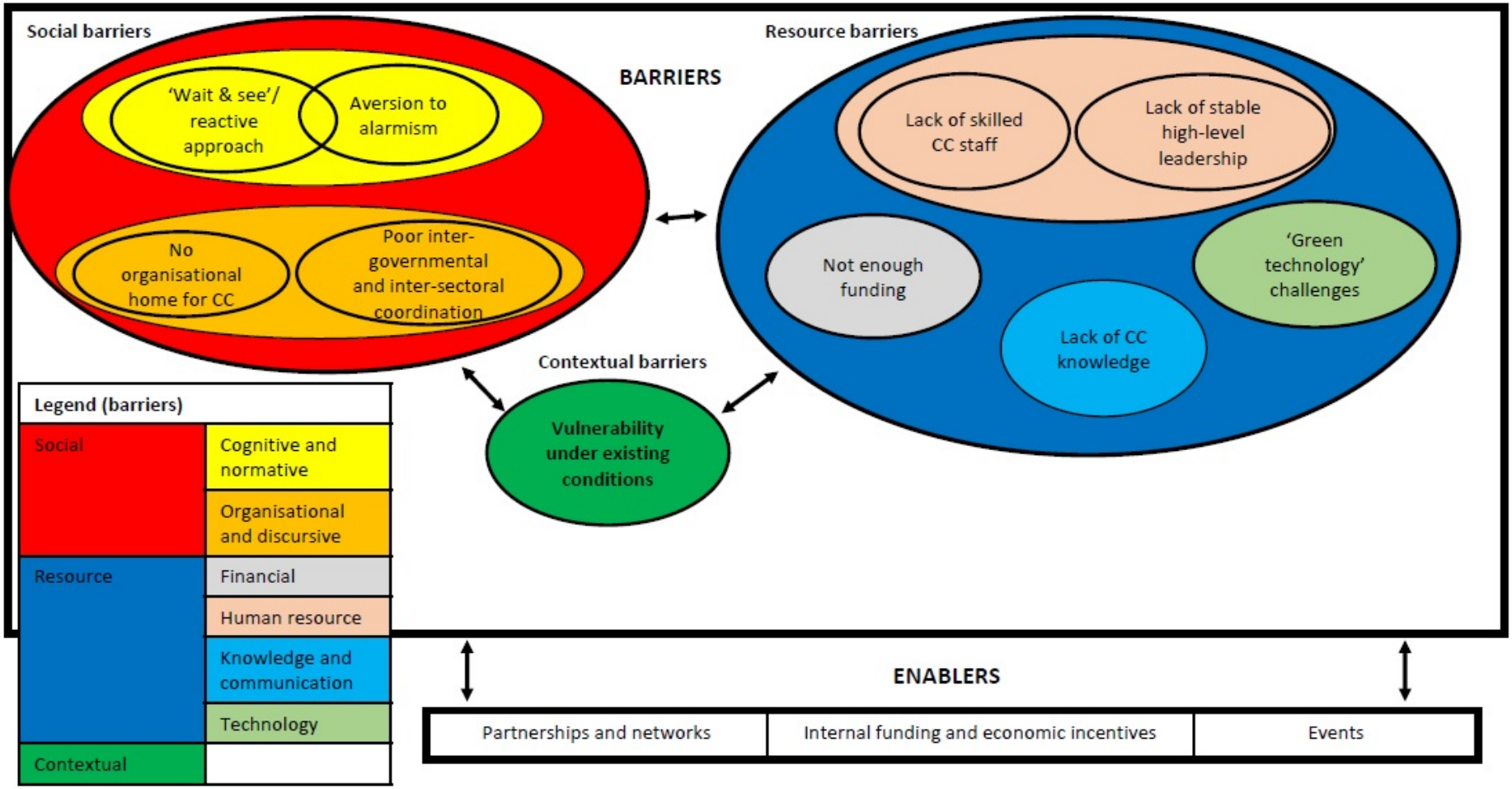

Figure 9.3. Overview of the barriers and enablers identified in NMBM

9.5. SOCIAL BARRIERS

9.5.1. Organisational barriers

Despite numerous attempts to institutionalise the CC function within NMBM, as of October 2014 no specific unit or directorate is directly mandated to tackle CC issues. CC work is being coordinated by individuals within the Environmental Management Sub-Directorate and the Energy and Electricity Directorate, with assistance from consultants. The challenge related to this situation is that the CC function is vested with a few individuals working within and with the municipality, and if they leave, it is probable that the CC work will lose significant impetus. The institutional knowledge and vital networks that these individuals possess will also be lost. In fact in all four of the case study municipalities, CC is associated with and driven by a small group of passionate individuals. This situation has pros and cons, which are discussed further in Section 10.2.

Other organisational barriers relate to lack of coordination between tiers of government and between sectors across the municipality (government, business[108], academia and civil society) in relation to tackling CC issues. NMBM 1 indicated in the feed-back session that national CC legislation could go a long way in enabling municipal CC work[109], as it has done for coastal protection; national coastal protection legislation has directed coastal municipalities to develop coastal set-back lines (Section 9.3.5). Although having said this, there has been a lack of national direction with regards to what methodology should be used to develop set-back lines, leading to different provinces and municipalities adopting different approaches (Province of the Eastern Cape, 2014; Mather, 2011). Further challenges exist in relation to insufficient funds for the development of set-back lines for the +/- 3000 kms of coastline that require set-back lines, and a lack of in-house and external expertise that is needed to conduct this work (Mather, 2011). This issue of *"lack of integrated planning between the three spheres of government"* is highlighted in the 2014/15 review of the Integrated Development Plan, as a key developmental challenge (NMBM, 2014a, p. 6). This is not a uniquely developing country problem. In Australian municipalities, consistent sea level rise policies were not available for adoption by local governments (Mukheibir et al., 2013), and Barnes, Hayes, Chatterton, and Longhurst (2014) discuss how a lack of national government support and direction is a major barrier to local air quality action planning in the United Kingdom. A final issue to discuss in this section, is that the municipality

[108] Although municipal/business CC interactions could be stronger, some interactions have occurred. In 2011, the NMBM business fraternity established an Environment and Greening Business Task Team. The aim of which is to bring together key stakeholders to green NMB businesses (Afri-Coast Engineers, 2013).

[109] Lack of CCA legislation in European Union countries has also proven to be a barrier to mainstreaming CCA policies (Juhola, 2010; Keskitalo, 2010 as cited in Dannevig et al., 2013).

relies on income from water and electricity sales, which is a disincentive for reducing consumption of these two resources (needed to combat CC).

9.5.2. Cognitive and normative barriers

In relation to the communication of CC knowledge, the interviewees revealed (as is discussed in Section 9.6.3) that trust and context are vital components in accepting new information. Hence, it could be hypothesised that any attempt to move NMBM's CCA work forward would rely on the information being communicated by someone that was trusted and that explicitly took context into account. Interviewees felt that some of the interventions being recommended by other countries to deal with CC may hinder the necessary development needed to overcome the twin priorities of poverty and unemployment in NMBM and SA more broadly. One interviewee also expressed an aversion to alarmism (see Section 8.6.2). For NMBM 2, all of these issues were intertwined with NMBM 2's faith and its association with climatic changes:

> *Scary. There are lots of things that happen, that the world is telling us. I subscribe to the religious belief that, quite clearly, during the end of times, a number of events will happen, what is happening. Nations will rise against nations, sons against fathers. This kind of weather. To me it brings to mind my religious beliefs. I don't think we're going to change what will happen... I have always distanced myself from these people who talk about the big bang. It is the same group of guys that talk about this CC issue. Speak to governments, to make sure that states change their ways. Impeding governments. I don't appreciate it. To try and sort of shape the course of our development to stick to the course that they have said, it's wrong. We as people, who are living here in SA, can be able to, we've got the thinking and the ability to be able to change and shape our own country, without others telling us what we should do. You know, these extremists, come with their alarmism. That's how I feel, and that shapes how I should conduct my job. If you don't live with God, as a person, as me, then I think I will be lost, because everything that we do finds itself in the Bible, I tread very carefully around those things. That's how I feel.*

The above quote and others within this chapter, alerted me to how values held by individuals can influence what kind of CC and CCA work is supported. O'Brien (2009, p. 164) indicated that *"values subjectively influence the adaptations that are considered desirable and thus prioritised".* When considering Schwartz's (2006 as cited in O'Brien, 2009) theoretical model of values, NMBM 2's value system is seen to align in many ways with the value group of 'conservation'. Within this group of values, conformity (obedience), tradition (humility and devoutness), and security (social order) are

considered important. This can be seen as a barrier to CCA, as adaptation often requires openness to change and flexibility, and these qualities align with Schwartz's (2006 as cited in O'Brien, 2009) grouping of barriers called 'openness to change', which is maximally different to the 'conservation' value group (O'Brien, 2009).

The association between CC and alarmism, also reflected in the quote above, is not unique to NMBM 2, Leiserowitz (2006) found that a significant proportion[110] of the 673 United States of America residents that he surveyed, associated global warming with 'alarmists'. Other studies have revealed that the alarm created by watching a film such as 'The Day After Tomorrow' did not lead to significant CC-friendly action, as the urgency felt post watching the film dwindled quickly (Lowe et al., 2006 as cited in O'Neill & Nicholson-Cole, 2009). In fact, Conway and Mustelin (2014) indicate that there is the potential for mal-adaptation if external urgency for adaptation (created by this alarmism) leads to hasty decisions under uncertainty.

The challenge of balancing development and growth with CC action, discussed by NMBM 2, is a significant issue, in developing and developed countries alike[111]. For CCA to be tackled with fervour at the local government level requires that the CCA/development links are made clear; development being a core function of local government (discussed by NMBM 4 and Ziervogel & Parnell, 2014). Individual belief systems, such as the association of CC with NMBM 2's religious beliefs, is also an important consideration. Studies have revealed that when individuals receive new information, belief systems are not updated but instead this new information is interpreted via existing belief systems (Leifert, 2011). Hence, communicating CC to enable action, would benefit from gaining an understanding of the individual(s) belief system to whom one is communicating.

The issues discussed above have all led, in relation to the CCA work, to a wait-and-see approach being adopted in NMBM, as expressed by NMBM 2: *"in Africa we adapt as we go"* and NMBM 1:

> *But my question for adaptation is in which cases is it critical to adapt ahead of time, because most adaptation, before we gave a word to it, it would happen. It starts getting warmer in an area and that continues for a couple of years, people start realising it and then they adapt…*

The reactive approach to adaptation[112] is reinforced by NMBM 1's assertion that people need to experience CC before they will take action (also discussed in Sections 6.8.8 and 8.6.2):

[110] One of the top eight associations, which accounted for 97% of responses.
[111] Jones (2014) found that sub-national governments in Australia and Canada struggle to balance socio-economic development with CC action.
[112] The code 'reactive adaptation' and 'CCA takes time' received 8 and 7 references respectively in the semi-structured interviews.

> *Your adaptation becomes very reactive, because that's only when people start to see the need. It's when they don't have a house, because it's flooded, or when they can't go out to work, because there is a river crossing the road. It's only then that they start doing something about it, but if you went earlier and said to them you need to relocate because you're in a river course, they will say no…*

In Australia, Moloney et al. (2014) found that scientists, government officials and community members associate CC with its physical impacts, and hence when these physical impacts (aligns with discussion in Section 8.7.1.2) are seen to be geographically and psychologically distant (as is the case in NMBM) then CC action becomes unlikely. Bahadur and Tanner (2014) similarly found little evidence of transformative institutional change before a disaster event occurred. Hence in NMBM big development projects are favoured, as this is what is deemed important now. NMBM 2 said:

> *I don't agree with that, like, we have massive coal reserves, what should we do, not use it, that I don't agree with. If you're saying it is wrong. I agree that it is wrong, it is unsustainable. Let's do something about it, but don't come and say that this particular year, that you will actually die if you don't do this, or that there is this massive thing that is going to happen… We need a powerplant type development, like Medupi. If we want real changes. You know, renewable energy is expensive, and so using coal and our reserves to power our economy has got to occur. This is the way that we can transform to be like a Cape Town or a Durban, we need a big project!*

The significance of these barriers was confirmed by NMBM 1 in the feed-back session, when she indicated that people in NMBM simply don't see CC as a reality and hence something that needs to be prioritised. She gave an example of how at a recent business forum, businesses were encouraged to consider reducing their carbon emissions in anticipation of national legislation which will enforce this. Their response was that they'll wait for the legislation before acting. This short-term/reactive response runs counter to the anticipatory action that is required for CC impacts to be adequately dealt with.

9.6. RESOURCE BARRIERS

Human and financial resource barriers were prioritised by the interviewees as the most significant barriers to CC work in NMBM, with two of the interviewees indicating that financial barriers need to be overcome first, as human resources can then be bought in. Human resource barriers in relation to lack of high-level leadership was discussed by NMBM 2, who said: *"I have realised that leadership is not going to come, not now"*. NMBM 3 indicated that due to NMBM's uncertainty with regards to the

direction of its CC work, external expertise, enabled by funding, should be brought in first, to develop a path for institutionalising the CC function and a CC toolkit, and thereafter permanent staff hired. Whereas NMBM 1's opinion was that good leadership and human resources would be able to attract the necessary funding. These human and financial resource barriers have also hindered the attainment of the necessary CC knowledge needed to tackle CC.

9.6.1. Human resource barriers

NMBM faces significant human resource barriers relating to a lack of high-level leadership on CC[113] and a lack of staff with CC knowledge and skills[114]. As NMBM 2 states: *"You have to have political stability. There are some structures that do not function at all, because they do not have enough or the right people, how then, do you add CC. They will laugh at you."* NMBM has faced significant high-level administrative and political instability. During 2013 the municipality saw the appointment of a new executive mayor and deputy executive mayor and four different city managers, whether acting or not. During 2013, most of the executive director posts were either vacant or occupied in an acting capacity, although this situation had largely been resolved by mid-2014.

The high-level instability in NMBM (prior to mid-2014) has meant that hard-won high-level buy-in for CC has been lost whenever a mayor or city manager leaves the municipality, resulting in no clear leadership in relation to how the CC function should be tackled within the municipality. The crises in leadership has also led to the municipality going back to basics[115] and business-as-usual practice, to ensure that the most essential mandate of local government - service delivery - is achieved, thus making it even more difficult for a 'new' issue such as CC to be prioritised. This situation is exacerbated by the fact that local government does not have a clear mandate to engage in CC work (an organisational barrier discussed in all three of the other case studies) as well as the cognitive and normative barriers discussed in Section 9.5.2. Pasquini et al.'s (2013, p. 229) research in the Western Cape revealed that political instability causes *"a significant disruption to the operation of municipalities with continuity being interrupted by changes in political vision, replacement of senior staff and administrative issues."* Pasquini and Shearing (2014) motivate that by institutionalising a CC function before political changes/instability occurs, will make it more difficult to disband the CC function if/when instability occurs.

[113] The code 'lack of high-level leadership and stability' received 13 references in the semi-structured interviews.
[114] The code 'lack of skilled staff to deal with CC' received 9 references in the semi-structured interviews.
[115] The official NMBM website indicates that the core tasks of the existing City Manager are to: (a) ensure service delivery; (b) undertake appropriate reviews of the Integrated Development Plan and the budget; (c) to fill staff vacancies (especially senior management); (d) establish ward committees; and (e) analyse and revise the institutional framework (NMBM, 2014e).

Due to this lack of leadership, lack of mandate, and lack of financial resources, those that have engaged in CC work to date have done so by doing this outside of their core function, increasing their workload significantly, and limiting the time they have had to up-skill adequately in this area. NMBM 3 stated:

> *Under normal conditions he has 10 000 things to do and renewable energy is just one of them, ja, just do this while you're busy, with your others, fit this in, fit that in… It's a little bit difficult when you don't have cash… If you're going to do something do it properly and we don't do our climate adaption, climate mitigation, and alternative energy carriers and investment opportunities around that source properly because it comes second…*

These overlapping issues were discussed by Mukheibir et al. (2013), who reported that Australian local government officials faced difficulties prioritising CCA as they deal with human, financial and technical resource constraints while having numerous competing priorities. Interviewees in their study discussed the usefulness of support from higher tiers of government, in this regard.

9.6.2. Financial barriers

Lack of funding for CC[116] was prioritised by all of the interviewees as a major barrier to CC work[117]. These challenges began in 2010 when extensive spending on new infrastructure for the 2010 FIFA™ Soccer World Cup negatively affected the cash flow of the municipality. There was also reduced impetus for CC work as the focus of the city turned to the World Cup and the City Manager who had been supportive of the work resigned. This case of stacked financial, human resource and organisational barriers, caused the progress being made on the CC work to be halted. Funding continued to be a challenge in 2011, resulting in consultants being unable to continue their CC work for the municipality. This lack of finance is reflected in the Integrated Development Plan, which indicates that NMBM is recovering from limited cash flow during the 2010/2011 financial year and having its credit rating downgraded in October 2012 (NMBM, 2014a). One of the reasons given for this downgrade is decline of institutional strength while socio-economic stresses have increased (NMBM, 2014a).

Due to these internal struggles to garner funds for CC work, international funding has been sought, but with little success. Consequently, interviewees expressed the perception that international funders only consider funding large South African municipalities and are overlooking NMBM. This

[116] The code 'not enough money available for CC' received 18 references in the semi-structured interviews.
[117] Also discussed by Blauw (2014).

perception can also be viewed as a cognitive barrier, as it is likely to discourage municipal officials from applying for funding in the future. NMBM 1 said:

> *International funders, they want to fund the city of Cape Town, or Joburg or Durban… Because they want publicity, you look at the proposal, and they want, you know, how is this innovative, how is this a model that can be used in other cities. They want to be able to say, Germany funded the development of this model, which is now being used… They want to get something out of it…*

Interviewees also expressed the view that raising international funding for CC work would mean that:

> *we then become vulnerable to people who want to give us money, we become vulnerable to countries like China. It then allows you to think, really as a poor person, instead of saying, no no no, I don't really need you, as such, I can survive on my own* (NMBM 2).

A CoCT official quoted in Ziervogel and Parnell (2014, p. 67) concurs, saying that reliance on international funding makes a municipality vulnerable to "*international trends, to funding models, to donors coming in and out"*. This being said, international funding has been a key enabler for the CC work conducted in EM and the CoCT (see Sections 6.8.3.1 and 8.9.2). Carmin et al. (2012) indicated that despite international funding being frequently shown to shape local agendas, in EM, international funding has been used to test adaptation ideas that were generated internally.

9.6.3. Knowledge and communication barriers

Staff engaged in CC work did not feel that they had enough knowledge on the topic[118], and found acquiring this knowledge difficult due to busy schedules. They also expressed difficulty in prioritising CC up-skilling when it's not one of their core tasks. It also didn't help that they saw CC information as contradictory and difficult to grasp. Staff consequently rely on secondary information, often from the media, who tend to report as much on climate scepticism as CC science (Vidal, 2014), which further endorses perceptions that the science is unreliable. Scientific messages are not easily incorporated into media communication, as the media requires information that adheres to political-economic and 'newsworthiness' imperatives (Vogel et al., 2007). Scientists are also not often trained to produce their knowledge in 'media-ready' ways and may not want to sensationalise or politicise their findings (Vogel et al., 2007).

[118] The code 'lack of CC knowledge' received 8 references in the semi-structured interviews.

The motives of those producing and communicating CC information was mentioned as important, which relates to overarching issues of trust[119] and context: *"It is important that you trust the person giving you this information, because lots of people are doing research. You can't accept everything that is said to you"* (NMBM 2). Cash et al. (2003, p. 8086) argue that only when scientific information is seen to be: (a) credible: the technical evidence and arguments are scientifically adequate; (b) salient: the assessment is relevant to decision maker's needs; and (c) legitimate: the production of the information and technology is perceived as respectful of the diverse values, beliefs, views and interests of stakeholders and unbiased; will response result. In the NMBM case, one can argue that due to a lack of CC knowledge, staff are unable to determine the credibility of the information. The relevance (salience) and cultural sensitivity (legitimacy) of the scientific information is often questioned; the communication of CC information being associated with those trying to pursue vested interests: "*To try and sort of shape the course of our development to stick to the course that they have said, it's wrong…"* (NMBM 2).

The Climate Response Status Quo Report (Section 9.3.7) highlighted a barrier to municipal CC work related to a lack of fine-scale CC information for NMBM (similar to Sections 6.6.1.2 and 8.7.1.2). When events are linked to CC without the science to prove such a link, trust in the science is further damaged, as articulated by NMBM 1:

> *For me, you look at something like the 2008 floods or storm event that we had. People immediately say its CC, and then I spoke to the guy from the weather station and he just said that everything that day, all the ingredients was there for a storm event, it wasn't unnatural. We have them from time to time, it wasn't CC.*

Communication barriers were discussed further during the feed-back session. NMBM 1 indicated that in general NMBM is not good at communication, either between departments or between the municipality and the public. Communication on CC has tended to occur sporadically in NMBM, when either an event, like COP17, or a significant weather event occured, both of which spur public and municipal interest. NMBM 1 indicated that the media has been the main communicator of CC in NMBM, and as is discussed earlier in this section, the media often over-stress the uncertainty of CC (Bailey, Giangola, & Boykoff, 2014). The municipality, reinforces communication of CC uncertainty, when public documents, such as the coastal set-backlines report, indicates that there are *"uncertainties surrounding the exact impacts of global warming, in terms of sea level rise and increased frequency and intensity of storm events"* (NMBM, 2012c, p. xii). Hence, the set-back lines

[119] The code 'mistrust' received 8 references in the semi-structured interviews.

report has been used to warn developers of the danger of sea level rise, as opposed to banning development seaward of the setback lines (Section 9.3.5).

Real and perceived uncertainties in relation to CC impacts, reinforce the tendency towards reactive adaptation (Shalizi & Lecocq, 2009) (discussed in Section 9.5.2). The perception of CC as confusing and overwhelming, and a lack of understanding of how local action can make a difference to this global problem, also contributes to reactive responses. Vogel et al. (2007) assert that if information is difficult to comprehend and interpret, this information may be ignored, regardless of how important it is. Hence CC communication should be done via short, simple messaging that is easy to understand and remember (van der Linden, Leiserowitz, Feinberg, & Maibach, 2014). Many people are still uncertain as to the causes of and solutions to CC, and don't view the issue as urgent, or something that can be tackled by personal or collective action (Vogel et al., 2007). Hence there is a need to communicate science in such a way that an appropriate sense of urgency is established, and coupled with that, people must be empowered to be able to respond, and to act in sustainable ways (Vogel et al., 2007).

9.6.4. Technology barriers

Technology barriers were discussed in relation to the implementation of a solar water heater project, where 1 263 households received a solar water heater (Wlokas, 2009). Despite significant effort being put into ensuring effective installation of the solar water heaters, complaints relating to leaking solar water heaters and poor smell, taste and colour of the water has been a problem; 53% of households that received a solar water heater requested maintenance within the first three months of installation (Wlokas, 2009). The solar water heater project has thus incurred high maintenance costs, leading to discussions as to who should be responsible for on-going maintenance, the municipality or the community members (Wlokas, 2009). This brings to the fore an important discussion in relation to the social justice lens of this thesis (Section 1.4.3). This 'new' green technology, is often implemented in poor communities who, although benefitting from having access to hot water and reduced energy costs, also have to deal with the maintenance issues of this 'new' technology. NMBM 3 indicated:

> *You were given a solar water heater and you had nothing before, you used to heat water from a kettle… cost us a lot of energy… now you have hot water, you have a 100 litres of very hot or luke warm water every day. Surely man if it starts leaking you can fix it, because what you are saving on your electricity account from using that kettle to bath with and everything, must be worth you maintaining it…*

Hence, techno-centric solutions, such as solar water heaters, unless coupled with an education and training programme, could be seen to lack sensitivity to the highly complex social world into which they are being inserted (Bahadur & Tanner, 2014).

9.7. CONTEXTUAL BARRIERS

Contextual barriers were not emphasized by interviewees, but as is illustrated in Sections 9.1 and 9.3 there are significant contextual challenges in NMBM, related to both socio-economic and ecological vulnerabilities. A contextual barrier that was mentioned by NMBM 2, was in relation to Port Elizabeth's main highway (the N2), which is often eroded by the sea. This challenge has been abated to a certain extent by the use of dolloses along this coastal road, but these hard defenses are often overtopped. Sea level rise is likely to further challenge the ability of the existing hard defenses to protect Port Elizabeth's key highway (the N2). NMBM 3 also mentioned that more and more people are moving into vulnerable locations (such as flood plains) to be close to potential opportunities, such as employment (a similar issue is being experienced in Cape Town, see Section 8.8).

9.8. ENABLERS

9.8.1. Partnerships and networks

The initial impetus for NMBM to consider its CC response came from interactions with NGOs and municipalities engaged in CC work. Hence, external pressure placed on NMBM was an enabler of the initial CC discussions. High-level leadership, which existed at that time (the City Manager was a CC champion), assisted in moving the CC work forward. But NMBM did not have the financial or human resources to pursue the work adequately, making partnerships and networks essential to the municipality's CC work. These partnerships and networks were enabled by key individuals who were passionate about CC work, and whose CC knowledge was bolstered by attendance at national and international conferences. Thus highlighting the role that these events can play in overcoming knowledge barriers.

An example of such a partnership exists between NMBM and Gothenburg Municipality. This partnership has played a key role in stimulating CC discussions in the municipality. One of the goals of the partnership is to examine the gap between policy and implementation in local government, relating to sustainable energy, inner city planning and development, CC and sustainable mobility (ICLD, 2012). A CC sub-project being taken forward as part of the partnership, aims *"to strengthen capacity around the institutionalization of climate response considerations into municipal planning and processes"*, as well as consider what barriers there are to effective climate response in NMBM and how they can be overcome (ICLD, 2012, p. 88). The final outcome of the partnership's projects is the

development of a toolkit which can be used by local government to narrow the policy-implementation gap (NMBM, 2014a).

Another important partnership has been between NMBM and ICLEI[120]. A discussion held with NMBM 4 revealed that they are working on the following projects with NMBM:

(a) An integrated urban water management project, being implemented with a CC lens. This project forms part of the 'Sustainable Urban Resilient Water: Developing Local Climate Solutions for Africa' project (late 2011 - late 2016), which is funded by the European Commission (ICLEI, 2013a).
(b) The 'Local Action for Biodiversity Wetlands and Communities project', which aims to raise awareness and promote sustainable use of wetlands by local government and communities. It is funded by the South African National Lotteries Distribution Trust Fund (ICLEI, 2013b).
(c) NMBM is a satellite city within the Urban Low Emissions Development Strategy, which assists cities in integrating low carbon strategies into all sectors of their urban planning and development. It is funded by the European Commission and implemented by UN-Habitat and ICLEI (URBAN LEDS, 2014).

The use of an informal inter-departmental network[121] to bolster the human resources needed to tackle CC, has also been an important enabler. This network exists at the stable middle management level of the municipality (the sub-directorate level) to circumvent the instability that has plagued the higher levels of the municipality. This network is not formally mandated, but is based on trust and good working relationships. Essential to this network are driven individuals who see the value of tackling CC, which is additional to their mandated work streams. This network has taken time to establish and is not part of the organisational structure of the municipality; it thus works in an organic fashion as it is not restricted by the silos and targets that exist within the municipal structures, but is vulnerable to disruption. An example of such a disruption, would be if/when staff essential to this network, leave the municipality, lose interest in CC, or are not able to find the time to engage with the CC work. This occurred when NMBM 1 (a key proponent of the municipal CC work) resigned, but fortunately was able to continue engaging in the NMBM's CC work via consulting to the municipality.

[120] ICLEI is a not-for profit global association of local governments who are committed to promoting sustainable development (Mukheibir et al., 2013, p. 25).
[121] The code 'informal networks' received 6 references in the semi-structured interviews.

9.8.2. Internal funding and economic incentives

Much of the municipality's CC work to date has been funded by the Energy and Electricity Directorate that has a significant budget at its disposal, which has allowed the CC work to proceed, despite significant financial barriers (see Section 9.6.2). The numerous energy efficiency and renewable energy projects that the Energy and Electricity Directorate funding has enabled (see Section 9.3.8) have bolstered the municipal's commitment *"to becoming a leader in the field of CC mitigation, the reduction of harmful GHGs* (greenhouse gases), *and the identification and implementation of alternative fuel sources"* (NMBM, 2014a, p. 282). NMBM 3 indicated that due to the fact that NMBM is relatively small in comparison to other South African metropolitan municipalities, it is sensitive to small changes in its financial situation, which alerted NMBM staff to the fact that civil society may move towards decentralised renewable energy due to electricity hikes. Rather than wait for this to affect the municipality's income, they have chosen to manage it by being innovative and allowing decentralised grid connections. Another enabler has been campaigns linked to economic incentives, such as the water reduction campaign that was enacted during a drought. During this campaign, residents were fined for overuse of water, which led to reductions in household water consumption. Interestingly, reduced water use was maintained post the drought, which affected the municipality's revenue stream. The fact that the municipality gains revenue from the sale of water is a disincentive for reduced water use, which is an essential CCA intervention for NMBM, particularly because CC predictions indicate a drying trend (see Section 9.1).

9.8.3. Events

Events linked to CC have played a role in enabling CC discussions and work. For example, COP17 stimulated CC publicity across SA, which led to municipalities such as NMBM holding numerous meetings prior to and post the event (see Section 9.3.3). Attendance at these events and conferences - both domestically and internationally - assisted in overcoming both human resource and knowledge barriers by up-skilling municipal staff who were able to learn from best practice initiatives[122]. During COP17 NMBM representatives visited some of EM's CC initiatives and heard about CHDM's RSCP, and were exposed to best practice in relation to municipal CC initiatives.

9.9. RELATING THE BARRIERS AND ENABLERS DISCOVERED TO CBA

In NMBM to date, the CC work has been driven mainly from a CC mitigation as opposed to a CCA or CBA perspective, due to the fact that: (a) the majority of the CC work has been funded by the Energy

[122] The code 'learning from best practice' received 8 references in the semi-structured interviews.

and Electricity Department (see Section 9.8.2); and (b) cognitive barriers relating to the 'wait and see' approach have led to the perception that CC impacts can be dealt with reactively (see Section 9.5.2). The fact that there is no organisational home for CC within the municipality, has meant that the CC work to date, has been undertaken in a rather unstructured fashion, enabled by a middle management network and partnerships (see Section 9.8.1). Those that have been driving the CC work indicated that they lacked adequate CC knowledge, implying that the full spectrum of CC responses may not been considered in NMBM. All of the barriers discussed above are obstructive to CCA, and especially CBA, as it involves adaptation interventions that go beyond reactive responses to CC impacts, to anticipating future changes.

A pertinent issue that came forward in the NMBM case, is the perception that to tackle CC, requires stopping or slowing development and economic growth (see Section 9.5.2). Essential to overcoming this cognitive barrier will be making the CC and development links more apparent, and taking advantage of synergies between adaptation, mitigation and sustainable development (see Klein et al., 2007). In the Integrated Development Plan, social justice and developmental issues are not related specifically to CC; making these links will be essential in motivating for CCA and CBA work in NMBM. An entire issue of *Climate Policy*[123] was dedicated to the task of integrating adaptation and mitigation within a developmental context. A potential way forward for NMBM, taken from this special issue of the journal, is the use of structured decision making tools (Wilson & McDaniels, 2007). These tools (e.g. objectives networks, influence diagrams) assist in making objectives and decision making processes more explicit and transparent, which is useful in dealing with complexity, and allows linkages to be made between adaptation, mitigation and sustainable development (Wilson & McDaniels, 2007). The participation and transparency that structured decision making processes enable is one of its greatest strengths, but may be a disincentive to organisations who want to control the decisions made (Wilson & McDaniels, 2007). Across the case studies, government's top-down decision making processes have been apparent, and are opposed to the values of CBA, and would run counter to the use of transparent structured decision making tools. Despite the fact, that these tools would assist not just in making development/CC links more explicit, but could be a useful way for the municipality to chart its CC future.

What was apparent in the NMBM case is that the prioritisation of human and financial resource barriers (likely to also present significant barriers to CBA) by interviewees in some ways masked underlying social barriers, especially cognitive barriers, which if overcome could unlock resource

[123] Bizikova, L., Robinson, J., & Cohen, S. (Eds.). (2007). Integrating Climate Change Actions into Local Development. *Climate Policy, 7*(4), 267-376.

barriers. Thus cognitive barriers are what is mainly discussed in this section. All of this being said, and despite significant barriers, NMBM is still undertaking CC work, and work under different banners, that have CC benefits. Examples of the latter, are the ICLEI projects that I listed in Section 9.8.1. Perhaps what is required first in NMBM is an investigation into what the municipality is doing at present that has CC links and building on these existing initiatives (likely a motiving factor behind the Climate Response Guide for NMBM [Section 9.3.4]). Drawing from EM and CoCT's experience; improving the municipality's reputation, by developing and then showcasing CC-linked projects, is a key enabler of resource injections into municipalities. Hence, building on these projects, and then showcasing their successes, could be a useful endeavour for NMBM staff. This being said, an organisational home and enhancement of human resources for CCA would likely be required to take this recommended work forward. Finally, in relation to CBA specifically, the vulnerability assessment, recommended for enactment in the Integrated Development Plan (Section 9.3.8), will be an important step in identifying particularly vulnerable communities to work with in the future.

PART III: SYNTHESIS OF THESIS FINDINGS

CHAPTER 10: ANALYSIS OF CROSS-CUTTING THEMES

10.1. OVERVIEW OF CHAPTER

This chapter brings together the findings of my thesis, to distil the key messages in relation to: (a) the different CC agendas being pursued in each of the case studies; (b) cross-cutting barriers to municipal planned CCA and CBA; (c) cross-cutting enablers of municipal planned CCA and CBA; and (d) how barriers and enablers interact.

10.2. THE CLIMATE CHANGE ADAPTATION AGENDAS IN THE FOUR CASE STUDY MUNICIPALITIES

Due to lack of clear municipal mandate and national and provincial direction (discussed further in Section 10.3.2), the municipal approach to CC in SA is not unified (Cartwright et al., 2012), and differs from municipality to municipality. Each of the four case study municipalities was seen to be pursuing a different CCA agenda, influenced by what placed CC on the municipal agenda, who was driving the work, as well as the municipality's context (see Table 10.1).

Socio-ecological resilience has been the key focus of EM's CCA work to date. This is reflected in EM's Integrated Development Plan: *"the EM must urgently invest in protecting, restoring and managing the city's ecological infrastructure in order to enhance societal adaptation and ecosystem resilience"* (EM, 2014a, p. 62 and see Section 6.3.9), and by the numerous ecosystem restoration projects implemented. These projects include the reforestation programme, including the BCRP; and the 'working for' programmes[124] implemented by EM, e.g. the Working for Ecosystems programme. EM is also focused on maintaining its position as a CCA leader. This role is bolstered by: (a) the strong international networks held by EM staff that link the municipality to knowledge and financial resources (e.g. collaborations with the Rockefeller Foundation and DANIDA); (b) the municipality's CC work being presented at international conferences; (c) EM hosting major CC events (e.g. COP17); (d) EM pioneering global initiatives (e.g. the Durban Adaptation Charter); (e) the municipality winning numerous CC awards (e.g. the UNFCCC's Momentum for Change Award); and (f) high-level political and administrative buy-in (e.g. the Mayor of EM is a member of the World Mayors Council on CC).

[124] The Department of Environmental Affairs, SA, has developed a number of 'working for' programmes to improve SA's environmental assets. These include: 'Working for the Coast', 'Working for Water', 'Working for Land', 'Working for Wetlands', and 'Working on Fire'.
For more information, see: https://www.environment.gov.za/projectsprogrammes#workingfor

CHDM, which exists within a predominantly rural and poorly developed context, has service delivery and relieving social ills as paramount priorities. Hence CHDM's CCA agenda is all about improving the socio-economic conditions of the rural poor, and since it is driven by the directorate responsible for health and environmental management, CC endeavors must have positive health impacts. The factors that enabled the RSCP, which has done just that, were money (initially DBSA funding) and human resources (project team for the development of an environmental management system and integrated waste management plan) becoming available, as well as the focusing effect that COP17 had on the CHDM's CC consciousness (see Table 10.1).

In the CoCT, CC is about doing development better. It is motivated that if communities are more energy and socio-economically resilient, they will be better equipped to cope with and adapt to a climate that is more uncertain and extreme. Hence, the agenda being pursued is that of energy security and sustainable development. Added to this, is a focus on adapting to CC impacts along the coast, which has been prioritised because Cape Town's coastline is vital to its economy. Observed and predicted impacts on coastal resources have brought to the fore the need for better coastal management.

High-level leadership instability has led to NMBM's focus on the core developmental mandate of local government and basic service delivery, as opposed to consideration of CC impacts. However, during 2014, high-level leadership was more stable and the potential for CC work to move forward increased accordingly. Energy efficiency and renewable energy initiatives have been driven strongly in NMBM by passionate individuals in the Energy and Electricity Department, as well as by economic drivers, such as anticipation of increased electricity costs.

Table 10.1. Case study municipality's CCA agendas

Municipality	**Initiator of the CC agenda**	**Main CCA agenda**	**Influencing factors**
EM	• Key municipal official being convinced of the importance of CC.	• Socio-ecological resilience. • International leader in municipal adaptation work.	• CCA work led by department with a biodiversity and ecosystem management mandate, with strong international networks.
CHDM	• Window of opportunity: intersection of money, people and events.	• Rural service delivery. • Linked health and environmental issues.	• Context: rural under-serviced municipality. • CC work led by department with a health mandate.
CoCT	• CC is identified as an opportunity to do development better and enable resource conservation.	• Energy security. • Coastal zone management.	• The poor/vulnerable lack adequate access to energy, despite the city's relatively high greenhouse gas emissions per capita.

	• Coastal impacts.		• Existing and predicted coastal degradation.
NMBM	• Pressure from external NGOs and other municipalities.	• Energy/developmental opportunities.	• CC work funded by the department with an energy and electricity mandate. • High-level leadership instability.

10.2.1. Do these different CCA agendas matter, and what do they mean for CBA?

The question that clearly presents itself then, is do these different municipal foci in relation to CC matter? There are both advantages and disadvantages to this situation. An advantage is that municipalities have been able to chart their own context specific courses in relation to dealing with CC. This has been enabled because national government, although highlighting the importance of provincial and local government tackling CC issues, has not been prescriptive as to how this should be done (see Section 10.3.2). Hence, CC initiatives and agendas have emerged that are: (a) appropriate for the municipality's context; (b) align with CC champions/engaged official's passions and skill-sets (see Section 10.4.1); and (c) complement existing municipal mandates. Conway and Mustelin (2014) argue that due to the fact that adaptation interventions tend to respond to multiple issues (not just CC), entry points for adaptation are often best aligned with: (a) existing policy and management portfolios; and (b) existing areas of expertise. CC champions *"typically have a strong rationale for seeking change and frequently will leverage their positions and resources to achieve desired outcomes"* (Maguire et al. 2004 as cited in Carmin et al., 2012, p. 20). A further advantage of this situation, is that the CC work is driven by a passionate team who are willing to go 'above and beyond' to overcome barriers to the work. Moreover, the relative flexibility that municipalities have been afforded in how they have tackled CC, has allowed valuable lessons to be learnt along the way. In many cases, municipalities have influenced provincial and national government in relation to CC, in a form of bottom-up governance. As EM 1 stated in relation to national government: *"they're often now following a lot of what some of the municipalities are doing…"*

The disadvantages of this situation are that: (a) CC is being driven by departments that have other mandates[125], diluting the attention that CC gets, which links to discussion on trade-offs between competing priorities (Section 10.3.3); and (b) these departments may not be placed in the best organisational position to enable strong CC action (Sections 8.7.1.1 and 10.3.2). Norwegian municipalities were also found to follow different agendas with regards to CCA: *"without clear guidance and incentives from the national level, adaptation in municipalities will continue to be treated*

[125] This is specific to CCA, as EM and the CoCT both have specific units that drive their energy work: the Energy Office and Energy and CC Unit respectively.

in a haphazard manner…" (Dannevig et al., 2013, p. 14). Hence in Norway, like in SA, local government officials are able to align CC with other agendas, without the same accountability afforded to more established functions. The long term sustainability of the CC function is questionable when the agenda is driven by *"personal convictions rather than a policy mandate"* (Ziervogel & Parnell, 2014, p. 67). The potential of whole interventions, or aspects of interventions to contribute to mal-adaptation[126] is relatively high when: (a) municipalities are learning-by-doing, with relatively little direction from higher levels of government; and (b) due to CCA being a relatively new field (especially for municipalities), best practice has not yet been established or universally understood. *"With no clear rules and norms… adaptation remains ad hoc & based on processes of 'muddling through' in a sense that increases risks of failure…"* (Preston et al., 2011 as cited in Mimura et al., 2014, p. 887).

The ad hoc nature with which adaptation is tackled, contributes to practices, like CBA, not being planned and implemented by municipalities, despite having sound principles that align with governmental aims (e.g. to increase vulnerable communities ability to deal with CC in the long-term). A number of potential problems may exist in relation to municipal enabled CBA: (a) government officials may not be aware of the existence of CBA; (b) if they are aware of CBA, they may not have adequate knowledge of its principles; (c) if aware of the principles of CBA, they may not know how to plan and implement this type of adaptation, and may not have access to the information and tools that exist to assist with CBA implementation; and (d) if they are aware of what is out there to assist in enabling CBA, they may battle to link these experiences and tools (most often from NGOs and developmental organisations) with the day to day realities of developing country local government (see for example, Section 8.8).

The question thus stands, who should be setting municipalities' CC agendas? Should it be national government, leading to a more coordinated nation-wide response to CC, but leading to reduced contextualisation and innovation at the local level? Should it be municipalities, leading to contextualised and innovative responses that may lack accountability, and may skip over essential interventions (e.g. CBA) that do not align with existing agendas? Perhaps *"a combination of top-down and bottom-up activities is, where national actors set a proactive agenda for climate adaptation and support implementation that occurs at sub-national levels"* (Urwin & Jordan, 2008; Bulkeley et al., 2009; Preston et al., 2013 as cited in Mimura et al., 2014, p. 887), is the ultimate solution. A middle ground needs to be reached, where national government guides municipal CC agendas, but allows for municipal autonomy, leading to well-supported, flexible and context specific decision making. But how

[126] *"Responses that worsen the situation or transfer the challenge from one area, sector, or social group to another"* (Moser & Boykoff, 2013b, p. 14).

this top-down/bottom-up governance approach could be enabled and implemented, is a much more difficult proposition. Even more transformational, and perhaps more difficult to envision, is for communities themselves to influence government's CC agenda, based on their concerns, wants, needs and goals for the future, which would align with the principles of CBA and social justice.

10.3. COMPARISON OF BARRIERS ACROSS CASES

Table 10.2 was produced from the 'key barriers and enablers identified' sections (e.g. Section 9.4) in each of the case study chapters, discussion of these barriers is presented below, in relation to similarities and differences between the case studies, and what the comparison reveals for municipal enabled CCA and CBA.

10.3.1. Cognitive and normative barriers

Cognitive and normative barriers were found to be related in most cases to municipalities favouring reactive approaches (see Table 10.2), which made planning for and implementing anticipatory CCA and/or CBA difficult. This barrier, overlaps strongly with contextual barriers; municipalities operate under severe resource constraints, where multiple priorities compete for limited resources, with initiatives that provide benefits in the now often being favoured. Document analysis in the systematic literature review revealed a similar issue; developing country municipalities struggle to move beyond reactive adaptation and technical fixes due to resource shortages and competing priorities (see Section 4.4.1). A theme specific to EM was that of mistrust, experienced in relation to the Durban CC Partnership, where EM attempted to create a cross-sectoral partnership for CC action. Although CHDM, CoCT and NMBM had engaged in some form of cross-sectoral interactions, none were as focused on cross-sectoral CC action and none followed as transparent a process (e.g. EM advertised for membership of the partnership in local newspapers), and hence did not experience mistrust as strongly as in EM. This being said, trust was an important issue in NMBM; interviewees indicated that they needed to trust the producers of CC science and information, to ensure that they were not being coerced into actions that would negatively affect municipalities' core goal of socio-economic development (see Section 9.5.2).

Table 10.2. Comparison of barriers across case study municipalities

BARRIERS	EM	CHDM	CoCT	NMBM
Cognitive and normative	• Discounting the future • Mistrust	• Perception of CC as overwhelming • Climatic events linked to culture/tradition leading to reactive responses	• Perception of CC as overwhelming • Reactive management	• Reactive approach to CCA
Organisational and discursive	• Lack of inter-governmental coordination • Complicated financial management system • Adherence to the top-down approach • BCRP: The top-down approach	• RSCP: Poor coordination within partnerships • Complicated financial management system • Lack of policy implementation • RSCP: Political barriers	• Lack of inter-governmental coordination	• Poor inter-governmental and inter-sectoral coordination • No organisational home for CC
Knowledge and communication	• CC science: difficulty in producing what practitioners want • The complexity of CCA • Limited communication and engagement	• Lack of CC knowledge • Lack of two-way knowledge exchange and community training	• CC science: difficulty in producing what practitioners want • CC as an environmental issue	• Lack of CC knowledge
Financial	• Complicated financial management system	• Complicated financial management system • Not enough funding	• Complicated financial management system • Lack of funding for implementation of the CCA Plans of Action	• Not enough funding
Human resource	• Not enough skilled staff	• Not enough skilled staff	• Lack of human resources needed to mainstream CCA	• Lack of skilled CC staff • High-level leadership instability
Technology		• Community members not trained to run RSCP technology independently	• Concerns re reliability of 'green technology'	• 'Green technology' challenges
Contextual	• Vulnerability under existing conditions	• Vulnerability under existing conditions	• Vulnerability under existing conditions	• Vulnerability under existing conditions

10.3.2. Organisational and discursive barriers

All case study municipalities adhered to a top-down approach and barriers related to this manifested in various ways, but were most apparent in EM and CHDM in relation to the way the BCRP and the RSCP were run. Interviewees from these municipalities also spoke about the complicated financial management system with more emphasis than CoCT and NMBM interviewees, as they were involved in the implementation of these innovative on-the-ground projects.

The lack of an organisational home for CC was a particular challenge in NMBM, where the loss of a key enabling official hindered the progress of the municipality's CC work. The placement of the CC function within municipalities was discussed by most municipal official interviewees, with mixed opinions as to where best to place the function. There is an ever-evolving debate as to whether the CC function is best placed in a centralised high-level unit, or whether a decentralised CC function is most beneficial. The advantage of a centralised unit is that CC may then receive greater priority. According to CoCT 1: *"if we are serious about CC, you would see that institutional change within the government structures, so that it would become the responsibility of the City Manager, or there would be people located in the Mayor's office…"* In NMBM, *"a proposal has been submitted in terms of business process re-engineering regarding the establishment of a unit to manage air quality and CC"* (NMBM, 2014a, p. 300). This being said, the more decentralised approach to CC in EM, which has been encouraged by the Municipal Adaptation Plan process (Section 6.3.4), has enhanced inter-departmental collaboration (Section 6.8.3.2). The need to reconsider government's institutional structure to be able to tackle CCA, which is inherently cross-disciplinary and messy, was raised in Section 4.4.1. However, the effectiveness of institutional structures has not yet been determined (Conway & Mustelin, 2014), and hence the debate continues as to how best to deal with CCA institutionally.

Lack of inter-governmental coordination (also discovered in the systematic literature review, see Section 4.3.3.1) was discussed by EM, CoCT and NMBM interviewees, but not emphasised by CHDM interviewees. EM, CoCT and NMBM are metropolitan municipalities, which have access to more resources than district (CHDM) and local municipalities. Therefore provincial government, which also suffers from human resource shortages, has prioritised assisting the more resource-poor municipalities[127] (such as CHDM). Provincial government resource shortages are a significant barrier to inter-government collaboration, because in SA, provincial government, which holds the environmental mandate with national government, is expected to coordinate both provincial and municipal CC work within its jurisdiction.

[127] Revealed during discussions with Western Cape and Eastern Cape officials.

In relation to national government, policy framings have been provided (see Section 2.2.2), these include: (a) the CC Response White Paper; (b) the Long Term Mitigation Scenarios; and (c) the Long Term Adaptation Scenarios. National government has also produced CC tools, such as: (a) the 'South African Risk and Vulnerability Atlas', which houses risk and vulnerability information for key sectors that can be used for strategy development and planning (see: http://www.rvatlas.org/); and (b) the 'Let's Respond Toolkit', which provides steps and tools for municipalities to prepare and plan for CC (Murambadoro, 2013). The South African Local Government association has also been founded **as** an organisation that represents local government at the national level, and offers CC assistance to municipalities. However, none of the municipal interviewees indicated that these national interventions had been a key enabler of their CC work to date. Furthermore, Ziervogel and Parnell (2014) found that EM and CoCT municipal officials did not feel that local government is valued or recognised adequately by national government. Lack of inter-governmental coordination is a particular challenge, because it may lead to national, provincial and local government working at cross-purposes; undermining robust adaptation (Ziervogel & Parnell, 2014). It also contributes significantly to municipalities having an unclear mandate for tackling CCA.

Lack of a municipal mandate for CC is an important barrier (discussed in Sections 6.8.5, 7.6.2, 8.6.1 and 9.5.1), as it exacerbates many other barriers. For example, the absence of municipal mandate for CCA makes it more difficult to motivate for high-level support for adaptation work, which undermines resource provision. Only what is mandated can be linked to municipal budget (de Visser, 2012), and issues of mandate lead to uncertainty in relation to who is actually responsible for CCA (Mukheibir et al., 2013). Municipal mandates are set and shaped by national and provincial government, and hence a municipality's ability to tackle CC can be both enabled and constrained by these higher tiers of government. In Section 2.2.2, I discussed how national government has acknowledged the lack of local government mandate for CC, as well as the lack of fiscal measures for local government to tackle CC (see Table 10.2: 'complicated financial management system' and 'not enough funding'). To overcome these issues, engaged officials (Section 10.4.1) in the case study municipalities drew on networks and partnerships (Section 10.4.2) and funding derived from various sources to move their CC work forward, in spite of, as opposed to enabled by, national government. But this is only a limited solution.

Glazewski (2012) and de Visser (2012) considered what a more lasting solution to the municipal mandate problem would be. Glazewski (2012) found that due to the ever-evolving nature of South African laws, policies and plans at all levels, an opportunity exists for the inclusion of CC resilience into

municipal planning[128]. Furthermore, municipalities have a greater level of independence under the post 1994 Constitution (Glazewski, 2012). De Visser (2012) indicated that the existing Constitution and laws of SA could be used to motivate for municipal mandate, but this would require: (a) highly skilled individuals with a law background to be able to make these arguments; and (b) municipal officials who are willing to take these innovative interpretations of the law forward.

10.3.3. Knowledge and communication barriers

Interestingly, the municipalities with more resources, EM and CoCT, who had been tackling CC for a longer period of time, expressed challenges relating to the complexity of CCA and the difficulty in applying CC science (Table 10.2). Whereas CHDM and NMBM, who had not grappled extensively with CC science and information, spoke about the barrier: 'lack of CC knowledge' (Table 10.2). Conway and Mustelin (2014) indicate that those new to adaptation often underestimate its complexity and expect that climate modelling will provide certainty around how to plan for a CC-affected future. The challenges related to applying CC science at the local level (discussed by EM and CoCT interviewees and in the systematic literature review [see Section 4.3.3.2]) provide further motivation for the co-production of CC knowledge, with careful consideration of the uncertainties and assumptions inherent in the process (see Conway & Mustelin, 2014).

Both EM and CHDM interviewees highlighted limited communication, education and training as an issue, especially in relation to the BCRP and RSCP, which relates to the top-down approach adopted, and is a key barrier to CBA specifically. Conway and Mustelin's (2014) adaptation experience in East Africa, China and the Pacific has revealed that this is not a challenge unique to EM and CHDM. They argue that this dilemma is contributed to by the fact that: (a) funding (in EM and CHDM, whether funding was derived from external or internal sources) for capacity building (as opposed to technical assistance) tends to be underrepresented on project budgets; and (b) the short timeframes given to deliver on project objectives mean that the slower processes of community participation often fall by the wayside. Part of the solution, will likely involve clearly defining what is meant by capacity building within a particular project's context, and then increasing the project's timeframes accordingly (despite the call for urgent CCA) (Conway & Mustelin, 2014).

EM and CoCT interviewees spoke about the challenges related to CC being seen as an environmental issue, and this issue was inherent in discussions with NMBM interviewees in relation to balancing developmental and CC priorities. In all four of the case studies, the CC work was driven to varying

[128] However changing the sections of the Constitution that spell out governmental mandates is likely to be an arduous process (Ziervogel & Parnell, 2014).

degrees, by environmental departments[129]. Dannevig et al. (2013) indicate that this is because engaged officials that conduct cross-sectoral functions, such as environmental management, are more adept at taking on cross-sectoral issues such as CC. These individuals are likely to have a broad area of expertise, and are often skilled in linking un-mandated issues with existing policy, and motivating for its inclusion on the municipal agenda (Dannevig et al., 2013). Some interviewees indicated that the association was deleterious for both the CC agenda, as environmental issues and departments tend to be under-resourced, and the environmental agenda, as CC deviates attention and resources away from environmental imperatives that are essential regardless of CC (e.g. biodiversity conservation, alien plant removal, reduction of environmental pollution, air quality monitoring). CoCT 1 and EM 26 said:

> *There is also a little bit of a danger that we become so focused on CC that we actually lose focus on what we need to be looking at on a daily basis. So, it's extremely important, but it can also, in a way, become its own worst enemy…* and *I also think that there has been abuse of the CC agenda by the greenies and that hasn't helped the cause... They've utilised the platform to drive green agendas…* and *I think CC is creating barriers, environmental issues have now become CC issues… the environmental sector is now being portrayed as a CC issue, to the detriment of other environmental work…*

In developing country municipalities in particular, there are a multitude of competing priorities, and hence trade-offs must occur. These trade-offs can occur between environmental and CC objectives, between CC and development objectives, and between CCA and CC mitigation objectives. Trade-offs are particularly pertinent to CBA, as ensuring that the principles explained in Section 2.4 are adhered to, requires significant resources. Determining whether scarce resources are utilised for CBA initiatives or other developmental projects presents municipal leaders with tough decisions. It is the decisions related to these trade-offs that lead to a certain agenda(s) being pursued, and due to the cross-sectoral nature of CC, municipal CC agendas can thus be quite different (Section 10.2).

10.3.4. Financial, human resource, technology and contextual barriers

In relation to financial barriers, EM, CHDM and CoCT interviewees discussed the challenge of working with the complicated financial management system municipalities adhere to, particularly when trying to enable innovative CC work, which cannot be planned and implemented like the business-as-usual, service delivery projects implemented by municipalities. CHDM and NMBM interviewees, who had less access to resources than their EM and CoCT counterparts, discussed lack of funding as a significant

[129] Responsibility for adaptation in developed countries too, tends to be placed with environmental ministries (Conway & Mustelin, 2014).

issue (Table 10.2). However, CoCT 1 did discuss lack of resources as a barrier to the CCA mainstreaming that the CCA Plans of Action project was aiming to achieve. The context of governance within SA, like many developing countries, involves the real and perceived threat of corruption, which is likely one of the contributing factors to why municipalities with better governance and management reputations, tend to receive more international funding than their counterparts. Hence, there is a real need for monitoring and evaluation tools that can be used by municipalities with varying levels of management expertise, to ensure that disbursed adaptation funds are spent wisely in the most vulnerable areas (which are often prone to corruption) (Conway & Mustelin, 2014). However, balance is needed, as if these monitoring and evaluation systems become too rigid, municipalities will not be able to practice the flexibility needed to implement context specific initiatives that evolve via learning-by-doing (see Section 6.8.2).

Despite the fact that engaged officials were an essential enabler to CC being tackled by all the municipalities (Section 10.4.1), most municipal officials interviewed discussed barriers relating to a lack of skilled human resources. CCA, and especially CBA, require skill sets that are sought after, and were found to be scarce in all four of the municipal contexts. One such skill, is the facilitatory skills needed to enable CBA, which was highlighted in one of the papers analysed during the systematic literature review (Ceccato et al., 2011, Section 4.3.3.2). Even the relatively resource-rich municipalities of EM and CoCT have battled to attract municipal staff with CC skills. Technology barriers were not highlighted as particularly important in any of the case studies, and were also found to be less pervasive than social and resource barriers in the systematic literature review (Section 4.3.3.2). This is likely due to the fact that the CCA interventions discussed by the interviewees were not technology-intensive. When this barrier was discussed, it was in relation to 'green technology' such as solar water heaters and their reliability.

Contextual barriers will exacerbate all of the barriers discussed in this thesis. Consideration of the context of developing country municipalities is of paramount importance, as CCA and/or CBA interventions are unlikely to be supported at any level (especially within government), unless they deal not just with anticipated CC impacts, but with present social, economic and ecological challenges, vested in the municipal context (reflected in the enabler: 'projects with ancillary benefits', Section 10.4.4). The competing priorities, trade-offs and difficult decisions that municipal staff have to make every day cannot be underplayed, providing further motivation for integrating CCA and development. The challenge for CCA, and particularly CBA, is to be able to achieve adaptation with development, while not losing the vital principles of CCA and CBA (see Section 11.2), particularly when viewed through a social justice lens.

10.4. COMPARISON OF ENABLERS ACROSS CASES

Five major themes were found when assessing what the major enablers were that allowed CC work to progress in the four municipalities. These enablers are summarised in Table 10.3 and explained in more detail in Sections 10.4.1 - 10.4.4. Section 10.4.5 discusses other researcher's findings on enablers to CCA and how they relate to my research.

10.4.1. Engaged officials and an enabling organisational environment

The primary enabler in bringing CC onto the municipal agenda in the four case studies was engaged officials or CC champions/leaders who are convinced of the importance of CC within the municipal context. These individuals punch above their weight in their ability to influence high-level municipal decision-making. These CC champions are convinced of the importance of CC, via learning experiences (e.g. workshops/conferences), as well as noticing CC-linked changes in the environment (see Section 10.4.3). Revi et al. (2014) indicate that human agency is essential in enabling local responses among low-income inhabitants and organisations. Human agency is also essential in developed contexts; the term 'engaged official' is taken from Dannevig et al's (2013) work; they too (in Norway), found that these CC champions were essential in placing adaptation on municipal agendas. They cite Kingdon (1995)'s work on 'policy entrepreneurs', who are described as individuals who are able to couple problem areas with policies during windows of opportunity. These individuals are motivated by their own worldviews, values and self-interest, and hence promote solutions that they can champion (Kingdon, 1995 as cited in Dannevig et al., 2013). Gogoi et al. (2014) call these individuals 'expert' actors, who they discuss as essential in promoting CBA[130].

Engaged officials then need an institutional/organisational environment in which they have the space and support to learn and act within new domains, such as CCA (Pelling, 2011 as cited in Dannevig et al., 2013). Hence, engaged officials in the case studies investigated mentioned things like: (a) CC was new in the municipality and hence no one was laying claim to it or dictating how it should be tackled; (b) the value of direct managers being supportive of their work, and not micro-managing it; and (c) the value of having 'the ear' of high-level administrative and/or political leaders in the municipality, due to the municipality's small size (as was the case in CHDM) or the reputation and standing of the engaged official(s) (as was the case in EM).

[130] However due to their focus on CBA, these 'expert' actors come from NGOs, research institutes and/or international agencies.

Table 10.3. Enablers of CC work in the four case study municipalities

	Engaged officials	**Enabling organisational environment**	**Networks and partnerships**	**Windows of opportunity**	**Projects with ancillary benefits**
EM	Environmental Planning and Climate Protection Department and Energy Office	• Supportive unit head. • Access to high level municipal leadership.	• International and national networks; bolstering knowledge, human and financial resources. • Sectoral CC champions.	• Focusing events (e.g. COP17, 2010 FIFA™ Soccer World Cup). • Extreme weather events. • Rolling black-outs for mitigation. • Innovative use of funding.	Buffelsdraai Community Reforestation Programme
CHDM	Municipal Health Services and Environmental Management Sub-Directorate	• Access to high level municipal leadership.	• Network with NGOs, consultants and researchers.	• Focusing events (e.g. COP17). • Innovative use of funding.	Rural Sustainability Commons Programme
NMBM	Environmental Management Sub-Directorate and the Energy and Electricity Directorate	• Not applicable during data analysis, but situation improved during 2014.	• Middle management network. • Partnerships with other municipalities, e.g. Gothenburg.	• Focusing events (e.g. COP17). • Extreme weather events.	Projects that have adaptation benefits, not acknowledged as such (see Section 9.8.1).
CoCT	Environmental Resource Management Department	• Supportive department head. • Access to high level municipal leadership.	• Network with NGOs, consultants and researchers.	• Focusing events (e.g. COP17, 2010 FIFA™ Soccer World Cup). • Extreme weather events for CCA. • Rolling black-outs for mitigation.	Energy security projects seen to achieve multiple benefits, including resilience to CC.

Thus skilled, passionate and driven individuals can only drive CC work if they operate within an organisational environment that: (a) allows them access to high-level administrative and political leaders to garner their buy-in; and (b) allows the flexibility needed to learn-by-doing and take on mandates that are not clearly local governments' (Section 10.3.2). Regarding (a), these engaged officials use the right language and tell the right story (Section 6.8.10), in relation to how CC is an important consideration for the municipality, often requiring that the link between the CC agenda and development and service delivery (core mandates of local government) is made. In EM, the links between CCA and development have supported the development of the adaptation work: *"because of pressure to ensure development-linked co-benefits adaptation responses have received more support than mitigation"* (Ziervogel & Parnell, 2014, p. 63). In the CoCT, the developmental co-benefits of energy interventions (e.g. energy security improving human well-being) has been used to promote the municipality's energy projects. In CHDM, the RSCP has been linked to developmental issues using both mitigation (e.g. the RSCP provides rural schools with renewable energy) and adaptation (e.g. the RSCP improves food security in a district municipality struggling with drought [set to worsen under CC conditions] and malnutrition) angles. In NMBM, engaged individuals have been able to motivate for CC mitigation work as a means to deal with developmental/economic issues, such as the constraints on provision of electricity, as articulated in NMBM's Integrated Development Plan: *"SA is experiencing a marked reduction in National Generation reserve margin"* (NMBM 2014b, p. 282).

The importance of an enabling organisational environment was also discussed by Burch (2010), who found that organisational culture and leadership played a vital role in enabling or hindering three Canadian cities from engaging in CC work. In the City of Vancouver, a culture of innovation and collaboration, stimulated by departmental leadership, led to CC initiatives being driven (Burch, 2010). Dannevig et al. (2013) found that when municipalities were too small to have the capacity to take on non-mandatory tasks, CCA was not considered. Due to the fact that I only considered municipalities that had conducted some CC work, this was not discussed by interviewees. However, during interactions with officials of local municipalities within CHDM (at the feedback session) it became clear that severe human resource shortages[131] would make it near impossible for these municipalities to take on CC work.

The second enabler (b) of a conducive organisational environment, i.e. the flexibility needed to learn-by-doing and take on mandates that are not clearly local governments', is reflective of a form of adaptive governance. Adaptive governance being an approach that acknowledges organisational barriers and encourages reflexivity and learning (Ziervogel & Parnell, 2014), in a holistic, flexible and

[131] Some municipalities did not even have an individual tasked with the environmental function.

interactive way, allowing uncertainty and change to be dealt with (Pereira & Ruysenaar, 2012). This enabler was important, but limited in the case studies, because local government, like most systems, relies on the notion of stable equilibria, where the future is predictable because enough information exists to be able to plan for it[132] (Ramalingam et al., 2008 as cited in Pereira & Ruysenaar, 2012) (see Section 1.4.2). Engaged officials operating within these systems of restrictions and rules, have experienced some level of flexibility due to the 'newness' of CC and the supportiveness of their direct managers. However, understanding how adaptive management manifests in the day to day operations of government, and how it can be better harnessed, requires further research (Eakin & Lemos, 2006 as cited in Pereira & Ruysenaar, 2012). Approaches to overcome organisational attraction to stasis has been discussed by Pereira and Ruysenaar (2012), and include the use of scenarios (see Section 6.3.4 where EM used this approach), and cross-sectoral partnerships, which are discussed below (Section 10.4.2).

The enablers of engaged officials operating within an enabling organisational environment assisted in overcoming multiple barriers. Driven individuals set up networks and partnerships (Section 10.4.2) that bolstered knowledge, human and financial resources, thus overcoming knowledge, human resource and financial barriers. These individuals, drawing on their networks, overcame and/or circumvented organisational barriers by driving work despite lack of inter-governmental coordination and municipal mandate for CC, as well as in some cases, no organisational home for CC.

Based on the findings discussed in this section (10.4.1), for CBA as described in Section 2.4 to be enabled in municipalities will require: (a) that an engaged official(s) are convinced of the importance of CBA and the social justice principles that it embodies; and (b) that a viable organisational mechanism is developed to enable the kinds of interactions and participation necessary for CBA. A mechanism which at present, does not exist, as stated by EM 2: *"it is a really nuanced interaction, it's not this call one big city meeting and you've got CBA, you've got to get down to KwaDabeka, and we've probably got to get down to the streets in KwaDabeka… and we're just not set up for that…"* I discuss these issues further in Section 11.2.

10.4.2. Partnerships and networks

Partnerships and networks were seen to be a major enabler of CBA in the papers analysed in the systematic literature review (Section 4.4.1). They were also found to be essential in all four case study municipalities for overcoming human, financial and knowledge resource shortages. Their ability to aid

[132] An issue difficult to handle in relation to CCA, due to CC impact uncertainties.

knowledge accumulation and increase access to the latest developments in the CC field, was highlighted by E 1:

> *What municipalities do, is less to do with resources, and more to do about knowledge... municipalities that do well have knowledge... the reason why metros do well, is that normally there are big universities associated with metros, and also there are consultants in easy reach...*

Examples of these networks in each of the case studies, include EM's networks between sectoral CC champions, formed during the Municipal Adaptation Plan process, and solidified via the enactment of joint endeavours (see Sections 6.3.4 and 6.8.3.2). In CHDM, partnerships (Section 7.8.2) have been used to implement projects (e.g. the RSCP) and networks have been established via mechanisms such as the Environment and CC Forum. In the CoCT, strong networks exist between government officials, researchers and certain NGOs (Section 8.9.1). In NMBM, a middle management network of like-minded individuals has been key to the development of the CC work, and partnerships with municipalities such as Gothenburg have also been useful (Section 9.8.1). Informal networks existed in all four case studies, which provided opportunities for learning, especially when they crossed different departments and sectors (also discussed by Dannevig et al., 2013). These networks contributed to trust-building and social capital (Pelling, 2011 as cited in Dannevig et al., 2013), which is essential when dealing with a new and uncertain issue such as CCA and CBA.

The partnerships and networks were established and maintained by the engaged officials. These individuals don't necessarily have to have a strong CC knowledge (like EM and CoCT officials have) but need to recognise the importance of CC, have influence, and access to networks. Ziervogel, Price, and Archer (2014) found that despite an engaged official in the Berg River Municipality having limited CC knowledge, this individual was crucial in establishing the networks needed to establish a researcher/municipal partnership (which incorporated CCA into the municipality's Integrated Development Plan). However it must be stated that an important enabler within two of SA's leading CC municipalities, EM and the CoCT, is the fact that municipal employees are themselves involved in research/scientific endeavours, often voluntarily and based on personal interest and passion[133]. These individuals in-depth knowledge of CC has increased the fruitfulness of their interactions with external academics and researchers, allowing them to keep up-to-date on the latest developments in the CC field, and to be encouraged by witnessing the global movement to tackle CC.

[133] Some of the municipal employees publish regularly (often with researchers and consultants) on the municipalities' CC work, and some have previously been employed in the academic field.

It was an early hypothesis (see Section 5.4.1) that the better resourced municipalities, EM and CoCT, would be further along in their CC work. Perhaps more important than the finance and human resources that EM and the CoCT have access to, is the knowledge resources that these municipalities possess, both internally (engaged officials) and accessed via partnerships and networks. The split between EM and CoCT, and CHDM and NMBM, in relation to resource enablers, has manifested in EM and CoCT citing issues relating to the complexity of CCA, and CHDM and NMBM citing lack of CC knowledge (see Section 10.3.3). EM and CoCT have conducted downscaling exercises, have been exposed to more CC science and engaged in more national and international CC discussions, increasing their understanding of the complexity of CC. Hence, the more officials understand, the more difficult the decisions become (Cartwright et al., 2012).

It is interesting to compare the CoCT's CC Think Tank, EM's Durban CC Partnership and CHDM's Environment and CC Forum in relation to this discussion. Although all three of these fora have the aim of tackling CC issues in a cross-sectoral manner, the Think Tank and Environment and CC Forum have a greater research, learning and awareness raising agenda than the Durban CC Partnership had (the inability of the partnership to enable actions, led to stakeholders losing interest). The establishment of these partnerships is in alignment with international best practice, as links between researchers and municipal officials play an important role in dealing with issues of complexity, as they create shadow spaces for discussion and discovery (Dannewig et al., 2013). Ziervogel and Parnell (2014) recommend the use of facilitators to enable social learning and bridge the often-present divide between researchers and practitioners, and Cash et al. (2003) advocate for the development of institutions/procedures that cross the boundary between scientific experts and decision-makers. These boundary organisations in the case of EM and CoCT were played by NGOs and consultants, but these individuals often did not have enough knowledge of either of the two communities to be fully effective in this role (Cartwright et al., 2012). To overcome this barrier, will require that researchers/experts become embedded in the problem and/or solution and that practitioners/decision makers inform the research questions and scientific knowledge produced (Cartwright et al., 2012). Furthermore, information needs to flow between the two sets of stakeholders in a flexible and iterative way (Cartwright et al., 2012).

Other challenges, experienced in relation to these partnerships and networks, were coordination issues (e.g. Section 7.5.1.3 and also found in the systematic literature review, see Section 4.3.3.1). These coordination issues are contributed to by the fact that adapting to CC is a complex process and includes a number of actors operating within different temporal and spatial scales (Ziervogel and Parnell, 2014). Hence, dealing with CCA requires strong organisational ability, regardless of the level of financial, human and technological resources (Inderberg & Eikeland, 2009). Any form of partnership

or network, whether between: (a) government departments; (b) government and other sectors; (c) across government tiers; or (d) between government and communities (a requirement of CBA); necessitates dealing with the challenge of bringing different stakeholders together. These stakeholders often adhere to different norms, have different discourses and expectations, as well as different understandings of what CC means (Moloney et al., 2014). Therefore, they often have different ideas as to what is considered reliable evidence, a convincing argument, what constitutes a fair process and what level of uncertainty is acceptable (Cash et al., 2003). More research is required to discover how South Africans, and in fact developing country stakeholders in general, define and understand CC, as a means of discovering ways in which this two-way communication could be improved[134] (see Sections 11.3).

The enabler of partnerships and networks, in all the case studies, manifested in relation to government departments partnering/networking with other municipal departments and/or NGOs, researchers and consultants. It did not relate to government partnering with communities, which is necessary for government enabled CBA. This being said, the challenges experienced in these partnerships, in relation to different worldviews, values and perceptions, is likely to manifest to an even greater extend between government officials and community members. This is especially the case because community members are likely to be of a different educational background, culture and socio-economic background to governmental officials, and more likely than not, speak a different language. Barriers relating to communities having different value sets and priorities to those implementing CBA projects, and the difficulty in translating CC into local languages, was discovered in the systematic literature review (see Section 4.3.3.1).

10.4.3. Windows of opportunity and evidence of CC

In the case studies, I found that on occasions where engaged official(s) were operating within an enabling organisational environment, drawing on partnerships and networks, and a window of opportunity presented itself, the CC work often moved beyond understanding and planning, to implementation. This is represented in EM and CHDM in relation to the BCRP and the RSCP, and in the CoCT and NMBM in relation to their energy security projects. A window of opportunity can present itself when: (a) a learning/awareness raising event occurs, such as COP17; (b) a weather event that can be linked to CC occurs (also reported on by Dannevig et al., 2013); (c) a socio-economic event occurs, such as electricity load-shedding; and/or (d) funding or human resources become available. However, caution was raised in relation to extreme weather events as an enabler, as when these

[134] I make this assertion, because the most comprehensive research on people's understandings of CC has been conducted in two developed countries: the United States of America and the United Kingdom (Leiserowitz et al., 2006; Lorenzoni et al., 2006 as cited in Moloney et al., 2014).

events were incorrectly linked to CC (as was the case in NMBM, see Section 9.6.3), mistrust resulted. With any window of opportunity, besides perhaps funding and human resources becoming available, unless they are taken advantage of timeously, the CC awareness raised can dwindle quickly.

Dannevig et al. (2013) indicate that when weather events are recurrent and perceived as real-world indicators of CC, even if they don't attract much media attention, they are likely to lead to municipal action on CCA, e.g. improvement of municipal infrastructure. Jones (2014) discussed how emerging political, economic and environmental problems provided windows of opportunity for sub-national CC work in Australia and Canada. Although not explicitly identified as an enabler in my research's case studies, what Dannevig et al. (2013) and Jones (2014) discuss, were in fact essential. These recurring events contributed to convincing engaged officials of the problem of CC, and have added to engaged officials motivations for high level buy-in. In EM, recognising the effect that CC would have on the municipality's biodiversity was critical, and in CHDM the negative influence that CC impacts will have on health and service delivery imperatives was key. In the CoCT, both the major physical challenges of sea level rise and flooding as well as social challenges such as poorly built structures in uninhabitable areas leading to community health problems (e.g. Tuberculosis), have made decision makers sit up and take note of CC. In NMBM, the physical evidence of CC was mentioned by NMBM 3 as a key factor in convincing him to drive CC work.

Hence, windows of opportunity and evidence of CC assist in bringing CC forward on municipal decision makers priority lists, overcoming cognitive barriers. However, utilising these events to drive anticipatory CCA and CBA is an important consideration, as waiting for an event to bring CC onto the agenda tends to encourage reactive responses. Therefore, using events to drive the institutionalisation of a function or gain commitments to long term interventions, while reacting to an event, are useful interventions for sustainable CCA and CBA.

10.4.4. Projects with ancillary benefits

In the South African municipal context, it is essential that CC projects have ancillary benefits that deal with the significant contextual challenges that exist (see Section 8.8), and assist in garnering community and municipal leadership buy-in. The lack of clear municipal mandate for CC (Section 10.3.2) also means that projects cannot receive funding if they only tackle CC, as only mandated interventions can be included in the municipal budget and receive funding (De Visser, 2012). The ancillary benefits of the BCRP and RSCP were discussed by EM and CHDM interviewees as essential to the projects' success (see Sections 6.8.6 and 7.8.1). These ancillary benefits offer solutions not just to future CC, but also present challenges; as was discovered in relation to CBA interventions reported on in the papers analysed via the systematic literature review (see Section 4.2.4). Although not explicitly

examined in this thesis, the energy security projects implemented by the CoCT and NMBM also have ancillary benefits. For example, the solar water heater programmes implemented in these two municipalities, reduce energy consumption, household energy costs, and free up time for poor communities.

The value of projects with ancillary benefits raises an important conceptual issue in relation to whether projects that have multiple benefits, that are a good idea regardless of CC, can be described as CC projects and receive CC funding. This links back to discussions on generic and specific adaptation capacity (see Section 8.5) as well as the difference between good development and CC (see Sections 4.3.3.1 and 6.6.1.1). The tailoring of adaptation work to suit the context and/or the individual or organisation one is working with, is useful as it allows the available skills and human resources to be utilised and allows for cross-sectoral dialogue (see Section 6.8.9), but may dilute the appropriate CCA focus. These conceptual issues are important and relate to how one defines adaptation, good development, resilience, sustainable development and even the new CCA buzz-word: transformation (see Section 2.3.2.3). What these terms mean and what they mean within the context of developmental local government is important, as it influences the kind of CC work that is planned and implemented, and what principles and power dynamics are implicitly or explicitly endorsed. Conway and Mustelin (2014, p. 341) concur: *"researchers and practitioners should pay attention to how the goals of adaptation become formulated and by whom; this includes examining who is best placed to lead or facilitate adaptation and who has the responsibility to communicate CC information."*

Another conceptual issue, which manifests in the outcomes and processes of projects, relates to this thesis' focus on CBA and the how the two projects examined, the BCRP and the RSCP, although implemented at the community level and having adaptation benefits, do not adhere to all of the principles of CBA (see Section 11.2). However, both these projects offer numerous benefits to communities, and despite challenges experienced (discussed in Chapters 6 and 7), have shown that local government can implement business-unusual projects at the community scale.

10.4.5. Further insights from the literature

10.4.5.1. Media and public pressure for CCA

An enabler discussed by Dannevig et al. (2013) is that of media and public pressure for CCA, the lack of which was thought to have contributed to the lack of political buy-in for CCA in Norwegian municipalities. Mass media coverage and public opinion are often essential components in providing the necessary impetus for politicians to consider an issue such as CC (Dearing & Rogers, 1996 as cited in Dannevig et al., 2013). The rationale being that politicians are only likely to champion an issue, if it can provide an electoral advantage, because it is a popular issue and able to win them votes (this was

found to be the case in Australia and Canada, see Jones, 2014). Hence, there tends to be a general coalescence between public opinion and policy development (Jones, 2014). Accordingly, Jones (2014) argues that to make politicians sit up and take notice of CC requires linking it to the concerns of the electorate.

In SA, the alignment between public opinion and local government policies and plans, is represented by the centrality of socio-economic and developmental concerns; issues like dealing with poverty, unemployment and crime, as well as improving service delivery and infrastructure provision. Thus making the link between CC and development is of paramount importance, which is a challenge in SA when CC is most often couched as an environmental issue, and an environment versus development discourse is in existence (see Leck et al., 2011, p. 66, for discussion on the 'environment versus development' discourse in operation in SA).

The enabler of media and public pressure for CCA brings to the fore the discussion on cognitive, knowledge and communication barriers within all four of the case studies, in relation to the fact that despite CC being acknowledged as an extremely important issue, people battle to find ways to deal with it proactively using their human agency (see Section 10.3.1). Until thresholds are crossed, CC is a rather insidious problem, and institutions and human beings in general are better at dealing with crises, and less adept at planning for things that creep up on you over the long term. As Pasquini et al. (2014, p. 5) state, *"it is human nature to discount the future"* and therefore losing out on short term (often socio-economic) gains for long term benefits, an important part of combatting CC, is difficult to enable within human decision-making (see Sections 6.5.2.1 and 8.6.2). This was discussed in all four case studies, in relation to: (a) reactive adaptation (see Sections 6.5.2.1, 7.5.1.2, 7.5.2, 8.6.2 and 9.5.2); (b) the need for insightful and brave municipal leadership (Section 8.6.2) to invest money in something like CC; and (c) the difficulty in considering CC within the challenging contextual conditions of South African municipalities, where multiple daily crises make considering CC rather overwhelming (Sections 6.7, 7.7, 8.8 and 9.6.1). These contextual challenges contribute too, to community apathy in relation to CC, which not only reduces communities' ability to consider CC and thus increase their resilience, but also reduces public pressure for CC interventions (see Section 6.5.2.2).

In SA, media and public pressure for CCA is not strong and politicians, unless canvassed by engaged officials, do not often prioritise CCA over issues that they see as having the ability to win them votes, such as service delivery and job creation. Madzwamuse (2014) indicates that in SA, lack of civic engagement in CCA is due to lack of access to the right information and necessary funding, not due to a weak civil society. But what is meant by 'right communication'? This links to discussion about how communicating CC in a way that is overly complex and difficult to understand, that invokes feelings of

fear and guilt, does not endorse civil or political support for CC, but in fact leads to issue avoidance (see Sections 3.2.1.4, 9.6.3 and Moloney et al., 2014). CC communication difficulties relate to challenges in communicating the nature of the risk, particularly because it manifests over long periods of time and in an elusive, often intangible manner (Moloney et al., 2014) [135].

In the developing country context, most people just want food on the table, a roof over their head and a job, and unless the CC story is told in such a way that it matters in these kinds of daily realities, civil society drive for CC is unlikely to occur in SA (see Section 6.8.10: discussion on the language of CC). This is a pity, especially in relation to this thesis' focus on CBA, as civic pressure for government to be doing more to combat CC is likely to be an important enabler of CBA; the essential community-led aspect of CBA having been started by the community itself. Community pressure for consideration of CC, would likely lead to a focus on adaptation, which is embedded in local realities; would likely align with community needs and desires; and would perhaps provide the necessary impetus for finding innovative ways for government to engage with civil society. It would also overcome the perception that communities are apathetic about CC (Section 6.5.2.2), and would demonstrate and build social cohesion (increasing adaptive capacity).

One way that civic pressure for CCA can be encouraged is through awareness, education and training, which was highlighted as important for municipal CC action in all four of the case studies. In EM and CHDM, community members expressed the value that they have received from the educational initiatives of the BCRP and RSCP. Project managers working on both these initiatives recognised that without community education, the sustainability of the projects will be jeopardized (Sections 6.6.1.3, 7.6.4 and 7.8.3). Developing well-informed community leaders who inspire others and bring them on-board, has been the approach taken by both EM and CHDM, as opposed to broad-brush communication. This approach has likely been influenced by human resource shortages, the prioritised goals of the projects, and that it is a useful way to enable buy-in and change in communities. Opportunities exist for the educational initiatives of the BCRP and RSCP to be built upon and expanded, likely to be an essential enabler in moving these projects closer to CBA as defined in the literature (see Section 11.2).

10.4.5.2. Relating my findings to framings of CCA enablers in the literature

I now relate my findings on enablers to framings found in the literature. One such framing comes from Carmin et al.'s (2012) research conducted in EM and Quito, Equator. They grouped enablers into endogenous and exogenous factors. I relate their description of enablers, within these two

[135] Drawing on work done by Doyle (2009); Lorenzoni et al. (2007); O'Neill and Hulme (2009); Weingart et al. (2000), as cited in Moloney et al. (2014).

classifications, to my findings in Table 10.4. An endogenous factor that was found in Quito and not reported on strongly in my cases[136] *was "creating opportunities for participation and ensuring voice for marginalized populations"* (Carmin et al., 2012 p. 28); this was identified as a potential failing of the case study municipalities (see Section 10.3.3) and a significant barrier to municipalities engaging in CBA (see Section 11.2). Carmin et al. (2012) also discussed information exchanges with other municipalities (an exogenous factor) as an enabler; this was found to be an important enabler in the initiation of NMBM's CC work.

Table 10.4. Engaging endogenous and exogenous factors for CCA according to Carmin et al. (2012, p. 28) and compared to my study's findings

Endogenous forces		**Exogenous forces**	
Carmin et al. (2012)	**My study**	**Carmin et al. (2012)**	**My study**
Local champions who have a strong rationale for CCA work and are able to utilise their position and resources for CCA.	See Section 10.4.1: engaged officials.	Shocks (such as natural hazards) and incentives (such as funding and technical assistance).	See Section 10.4.3: windows of opportunity.
Linking CCA to the sustainable development objectives of municipalities.	See Section 10.4.1, in relation to using the right language.	Linking funding with adaptation.	See Sections 10.4.2 and 10.4.3: how networks and windows of opportunity relate to funding.
Linking adaptation to existing departmental agendas.	See Section 10.2, in relation to municipal CC agendas.	Hosting and attending international conferences and promoting a municipality as a leader.	See Section 10.4.3, e.g. how COP17 bolstered CC knowledge and attention in SA, and was a platform for leadership.
Working with partners and networks internal and external to the municipality.	See Section 10.4.2: partnerships and networks.	Partnering with international organisations.	See Section 10.4.2: partnerships and networks.
Linking pilot projects to adaptation.	See Section 10.4.4: projects with ancillary benefits.		
Building on existing environmental programmes.	See Section 6.8.9: building on existing knowledge. The link between CC and environment was also described as a barrier, see Section 10.3.3.		

[136] Except in relation to the Durban CC Strategy (Section 6.3.8).

Carmin et al. (2012) found that exogenous factors tend to lead to the initiation of work in 'late-starter' municipalities and that endogenous factors tend to lead to the initiation of work in 'early-starter' municipalities. All the municipalities in my study benefited greatly from the endogenous factors listed in Table 10.4 to initiate their CC work. This is not unexpected, because all four municipalities have been 'early-starters' with regards to tackling CC at the municipal level in SA. The exogenous factors have also been important in taking their CC work forward.

Pasquini et al. (2014) conducted research into what enables CCA mainstreaming within the CoCT and Hessaqua municipalities (both located in the Western Cape, SA), and grouped these enablers into: (a) leadership; (b) cost; (c) recognition of the value of the natural environment; (c) a knowledge base; (d) institutional size; and (e) political stability. The role of leadership (a) aligns with my discussion on engaged officials. Pasquini et al. (2014) found that in Hessaqua Municipality, political as opposed to administrative leadership (which was more common in my case studies) allowed quicker and more wide-spread changes across municipal siloes, due to the power of high-level politicians (see Section 8.8). Their enabler of cost (b) relates to CC impacts and the cost of maintaining existing infrastructure, which aligns with CC-linked events discussed in Section 10.4.3. They assert that a municipality that values the natural environment (c) is more likely to engage in CCA interventions, which they found to be an enabler for the CoCT, which has a sound understanding of ecosystem services. The value of ecosystem services and the link between these services and CC, is a key component of EM's CCA agenda (Section 10.2), and likely contributes to why CCA is most often taken up by environmental departments.

Like was the case in my research, Pasquini et al. (2014) found knowledge (c) to be a key ingredient for CCA mainstreaming. Access to this knowledge via networks and opportunities to attend learning events were essential to the CoCT and Hessaqua municipalities (Pasquini et al., 2014), as I discovered in my case studies (see Sections 10.4.1 and 10.4.2). An *"integral component of successful climate mainstreaming rests on the creation of new relationships of knowledge production and exchange – and hence on the ready availability (or accessibility) to municipalities of sources of environmental knowledge"* (Pasquini et al., 2014, p. 7). Institutional size (d) was raised as an issue that needs further research in relation to how larger municipalities, although able to access more resources, operate within municipal siloes, and smaller municipalities, although having denser social networks across municipal siloes, are less able to access significant resources (Pasquini et al., 2014). I found that EM and the CoCT had accessed more resources for CC than the smaller municipalities of CHDM and NMBM, but had limited success in cross-sectoral dialogue due to different norms and discourses in operation. Whereas in the smaller municipality: CHDM, CHDM 1 was able to access high-level leadership with relative ease. Lastly, the issue of political instability (e) (discussed by Pasquini et al.,

2014), emerged in relation to NMBM, where it resulted in CC not being prioritised and well-resourced (see Section 9.6.1).

10.5. INTERACTIONS BETWEEN BARRIERS AND ENABLERS

This study has revealed a number of insights within a field that has had limited exploration: barriers to and enablers of municipal planned CCA, with a focus on CBA. A key discovery was that, in the case studies explored, the enablers that led to barriers being overcome were more about changing the way things are done, as opposed to the direct opposites of barriers. Enablers are more about process, and hence one enabler can overcome multiple barriers. For example, as is highlighted in Section 10.4.1 engaged officials operating within an enabling organisational environment can overcome and circumvent multiple barriers, in multiple categories. On the other hand, sometimes multiple enablers are needed to overcome one barrier. For example, to overcome financial barriers did not simply require an injection of funds into the municipality, but enablers such as municipal staff: (a) practicing innovative budgeting; (b) learning new financial management skills; (c) drawing on networks with national and international funders; and/or (d) making the right argument to high-level decision makers as to the importance of the work (whether CC in general, CCA, or a specific approach to CCA).

CHAPTER 11: FINAL DISCUSSION AND CONCLUSION

11.1. OVERVIEW OF CHAPTER

The final chapter of my thesis draws together the key findings of my research in relation to South African municipalities' ability to enable CBA (Section 11.2), and recommendations in relation to how practice and research of municipal enabled CCA and CBA can move forward in the future (Section 11.3). I make some final comments in Section 11.4.

11.2. ARE MUNICIPALITIES ABLE TO IMPLEMENT CBA AS DEFINED IN THE LITERATURE?

11.2.1. CBA ideals versus municipal realities

A call for mainstreaming, up-scaling and out-scaling[137] of CBA has been made (see Gogoi et al., 2014; Huq & Faulkner, 2013; Reid, 2014; Reid and Huq, 2014; Schipper, Ayers, Reid, Huq, & Rahman, 2014), due to the realisation that localised CBA projects will: (a) not adequately deal with the scale of the CC problem at hand (Reid & Huq, 2014); and (b) only provide benefits to the community(ies) involved (Gogoi et al., 2014). Governments from around the world have begun to show increasing interest in CBA, with the focus of the 5th international CBA Conference[138] on 'Scaling Up: Beyond Pilots' (Reid & Huq, 2014). A particularly important step in responding to this call, is for CBA to be mainstreamed within governmental planning, and as is articulated in Section 1.2, local government as the tier of government closest to communities, has an essential role to play if this is to be achieved. This mainstreaming of CBA (e.g. into government planning) is seen to be a sustainable, effective and efficient way of conducting CBA (Klein et al., 2005 as cited in Reid & Huq, 2014), as CBA is then not seen as a threat to other programmes or projects, or in conflict with existing policies (Lebel et al., 2012 as cited in Reid & Huq, 2014). However, mainstreaming CBA into local government planning and implementation is a difficult endeavour, because: (a) developing country municipalities operate within contexts where multiple competing priorities vie for limited attention and resources; and (b) municipalities operate in ways that are difficult to align with some of the core principles of CBA (discussed below). There is thus the potential that in an attempt to mainstream CBA in municipalities, its core principles (which make it an effective and sustainable mechanism for community-level CCA, see Section 1.2) may be muddied or lost.

[137] Up-scaling involves horizontal transfer of an initiative and out-scaling involves vertical transfer of an initiative (Sova, Chaudhury, Helfgott, & Corner-Dollof, 2012).

[138] Organised by the International Institute for Environment and Development, the Bangladesh Centre for Advanced Studies, and local partner organisations.

Despite the fact that government is an obvious choice when considering which organisations are best equipped to deliver CBA at scale (see Section 1.2 and Gogoi et al., 2014), they operate in a centralised and hierarchical way, with procedures in place to ensure efficiency for the achievement of effective service delivery. In Section 1.4.2 (governance lens), I discuss how organisations like municipalities, favour exploitation over exploration when resource-constrained, as exploration (which is needed to tackle a new function like CBA) requires significant resource inputs and risk-taking, which counters the stability that organisations rely on (this thinking was influenced by Duit & Galez's [2008] research). Within organisations like municipalities, decentralised decision making, flexible institutional and funding structures, and recognition of diverse cultures and norms (Ayers & Forsyth, 2009), all essential to CBA (Gogoi et al., 2014), are difficult to enable. It is not just government that finds adhering to CBA's core principle of empowerment challenging, but any organisation/actor attempting to implement CBA (Gogoi et al., 2014). For municipalities the challenge is exacerbated by the fact that: (a) municipal governance systems and funding structures are fairly rigid, discussed under organisational and financial barriers in the case studies (see Sections 6.5.1.1, 6.5.1.3, 6.5.1.4, 7.5.1.1 and 8.7.3); and (b) human and financial resource shortages within municipalities hinder the kind of on-the-ground fine-scale community interactions necessary for CBA, that allow two-way communication of knowledge and information, and social differences within heterogeneous communities to be taken into account.

I deal first with the CBA principles of interventions being bottom-up, community-led ("*grassroots-generated solutions"* [Gogoi et al., 2014, p. 1]), participatory and acknowledging different knowledge systems (see Section 2.4). The two community level projects investigated which have adaptation benefits, the BCRP and RSCP, were initiated, planned and implemented by 'experts', and are run in a rather top-down fashion, with most project decisions made by the government and NGO project managers. These 'expert' actors are essential, as they link communities to resources, technical support, supplementary information and the institutional support and networks that communities would not have been able to access alone (Gogoi et al., 2014). But these 'experts' operate within completely different worlds to community members, hindering two-way communication and participation. Participation when implementing adaptation is not just important in promoting the social justice principles of fairness and equity, but also in avoiding the difficult situation which presents itself when community priorities differ from external actor priorities (Conway & Musetlin, 2014). Conway and Mustelin (2014) found that discussing issues which are a priority to community members improves participation, which reiterates the importance of projects with ancillary benefits (Section 10.4.4). Conway and Mustelin (2014) offer avenues to increase community participation, such as

community representation on programme/project advisory boards, and apportioning funds to targeted community engagement activities (e.g. increasing youth involvement).

Community-led aspects of the BCRP relate to the community structures that have been put in place, where groups of 'treepreneurs' fall under 'facilitators' who communicate project information to them, and can feed back community concerns or ideas to the on-site managers. Community-led aspects of the RSCP relate to the schools being chosen due to their interest in sustainability issues, and running the projects post installation, although with limited independence (see Sections 7.6.3 and 7.6.4). But despite these aspects, decisions on how the projects are run are made by government and NGO managers and not by community members, and the existing power dynamics of community-reliance on government assistance, has largely not been questioned or altered. This being said, when I asked community members who owned the projects, most indicated that the community did. Managers of the BCRP and the RSCP recognised that more could be done to enable community members to run both projects independently (see Sections 6.6.1.3 and 7.6.4), with EM set to invest significantly in community education and training in the near future (see Section 6.6.1.3).

Likely the strongest adherence to the CBA principles, comes in relation to the BCRP and the RSCP being developmental. Both projects provide multiple benefits, including socio-economic benefits in the present (see Sections 6.8.6, 7.8.1 and 10.4.4). Although community members have derived a sense of self-worth and achievement from their involvement in the projects, it is questionable whether they are empowered to independently improve their resilience to CC. Empowering a community to participate fully in a project or programme, to be able to make meaningful contributions and having the confidence to do so, is a long, slow process, and based on municipal/community trust. Lack of trust between civil society and the municipality was discussed by EM interviewees (Section 6.5.2.2), and is likely a factor in most South African municipalities due to service delivery backlogs and the related civil unrest.

This being said, if one was to consider empowerment as McKenzie Hedger, Mitchell, Leavy, Greeley, and Downie (2008, p. 25)[139] do, as about promoting literacy, gender empowerment and income generation, the BCRP and RSCP perform better. The BCRP does this through the encouragement of trading trees for school fees and the RSCP through the additional learning that the project provided for school attendees. In relation to gender empowerment and income generation, most of the 'treepreneurs' in the BCRP are women and income has been freed by their involvement in the project. However the long-term prospects (post completion of the project) of generating income from the sale

[139] In relation to how they define an adaptation strategy that aims to empower people.

of trees is less certain for BCRP community participants. Some income generation has occurred via the RSCP, when excess crops have been harvested and sold to community members.

Another important aim of CBA is to *"strengthen the capacity of local people to adapt to living in a riskier and less predictable climate"* (Ayers & Forsyth, 2009, p. 1), and hence improve their adaptive capacity. The African CC Resilience Alliance has developed a Local Adaptive Capacity framework to assess how community-level projects influence community adaptive capacity (Gogoi et al., 2014). The five components of this framework relate to (see Jones, Ludi, & Levine, 2010, p. 4):

- the availability of assets for response to changing circumstances;
- the existence of institutions that enable fair access and entitlement to these assets;
- the ability to garner, analyse and disseminate knowledge and information useful for CCA;
- the existence of an environment that is supportive of innovation and experimentation, allowing opportunities to be taken advantage of; and
- the ability of governance structures and future plans to take account of and respond to changing circumstances.

The African CC Resilience Alliance's work has led to a number of important lessons for CBA, which include the need to address as many of the framework's inter-connected components, as well as rethink community participation (Gogoi et al., 2014). Participation that leads to increased adaptive capacity requires meaningful engagement, addressing power imbalances, and two-way knowledge sharing (Gogoi et al., 2014), which requires significant investments of time and financial resources. The latter are in short supply in developing country municipalities. The resources needed for this level of participation, plus the resources needed to generate a grassroots project model, as opposed to an expert generated model (as was used in the BCRP and RSCP), are significant. Roll out of these types of projects will be resource intensive, as it will require starting again by first engaging with communities about their vulnerabilities, priorities and preferences and then developing a tailored solution with them.

Having experience-based framings, such as the African CC Resilience Alliance's Local Adaptive Capacity framework in mind prior to and during project implementation is likely to be a useful means of improving the ability of community-level interventions to increase community resilience. Monitoring and evaluating community-level interventions in relation to whether they are meeting expectations, achieving the right objectives in the right way, and being implemented at the right scale, is also essential (Action Research for Community Adaptation in Bangladesh, 2012 as cited in Gogoi et al., 2014). Monitoring these interventions can also alert one to missed opportunities, areas of weakness or even project component overhauls that need to occur (Gogoi et al., 2014).

11.2.2. What does this mean for municipal planned CBA?

In asking the 'so what' question in relation to CBA ideals versus municipal realities, four options present themselves. The first would be that the definition and understanding of CBA (Section 2.4) needs to be adjusted for municipalities, within their present structures, to be able to plan and implement it. This solution would require that municipalities are vocal about the challenges that they face in planning and implementing CBA as defined in the literature, and that researcher/municipality partnerships are strengthened to discuss these issues, for the further development of the field. The development of the CBA field would also benefit from rigorous assessment of its advantages and disadvantages, and its ability to increase the adaptive capacity of the most vulnerable (Reid & Schipper, 2014). CBA, like any practice, has limitations and merits, and will likely have limitations and merits specific to who partners with communities in implementing its interventions, all of which requires further investigation.

The second option would be to say that in fact municipalities are not equipped to implement CBA, as understood in the literature, and therefore CBA must remain in the developmental/NGO realm (where it began and exists to a large extent at the moment), financed by international funders. Under this option a municipality's role would relate to what CoCT 1 indicated:

> *The key interventions that local government can do is at that large scale around planning utilities, water security, food security, it's making sure at that level we are making the right decisions, and we are being proactive around it… which ultimately reduces the risk for communities…*

However, this option counters the assertion that for CBA to adequately contribute to dealing with the scale of the CC challenge, government has an important role to play. Government has the ability to move CBA from being implemented in a piecemeal fashion (within limited temporal and financial parameters) to something that is mainstreamed and implemented at scale (see Reid & Huq, 2014). As EM 2 indicates: *"so when NGOs come and go… when funding dries up, then NGOs disappear, they do other things, you need something that is there as a touch point for civil society constantly."* Others, such as Gogoi et al. (2014), indicate that the private sector and NGOs also possess the potential to deliver CBA at scale. An example is the Global Environmental Facility's Small Grant Programme's CBA[140] arm that has enabled 491 CBA projects, implemented mostly by NGOs and Community Based Organisations. Up-scaling has occurred via projects becoming demonstration sites, national steering committees identifying best practice to be taken forward, and the award of follow-up grants[138].

[140] See: https://sgp.undp.org/index.php?option=com_areaofwork&view=summary&Itemid=177 Accessed 13-11-2014

A third option, would be to build upon the use of partnerships, which have enabled community-level projects as stated in the literature (see Section 4.4.1) and within the four case study municipalities (e.g. the BCRP and RSCP), despite expressed coordination challenges (Sections 4.4.1 and 7.5.1.3). Existing partnerships could be built upon to include CBA-specific aspects, and new partnerships developed with these principles built in. Within this option, NGOs, Community Based Organisations and/or consultants partner with municipalities, and use their positions outside of the municipal structure to engage creatively with community members, investing the necessary human resources needed for on-the-ground interactions. As CHDM 2 states:

> *I think partnerships are a large part of the option, I don't think any one organisation can do it on their own, there's just not enough capacity. Financial gaps, expertise gaps across the board, but when you have expertise coming from one area, finance coming from one area, you can do a lot more… Ja, I think a NGO hammering away on its own is going to have limited success. They are going to inspire a few who are keen anyway. Um, government on their own might meet resistance along the way, because it's government, you know. Sometimes people are very cynical about government and their initiatives, um, big corporates, people always kind of question motives: Why and where? What's the bottom line? Tripe bottom line vibe. But when we come together, there is a merging of these things…*

Within this option, of building on existing structures and practices, could be better use of municipal ward committees, as a means of enabling more decentralised decision making within local government. Since 2001, ward committees have formed part of local government's attempts to achieve participatory governance (a principle housed in numerous pieces of legislation and policy) (Smith, 2008). The role of these committees is to bridge the gap between communities and the political and administrative structures of municipalities (Smith, 2008). Hence, they could play an essential role in enabling CCA and CBA that is applicable to the community context, due to the scale at which they operate. Unfortunately, as is documented in Smith's (2008) research (based on research within six South African wards), these committees face numerous challenges, with most of the ward committees he researched not functioning effectively: (a) they struggled to gain adequate input from the communities within their wards; and (b) channels to move ward committee suggestions to higher level decision making bodies within the municipality were ineffective (leading to loss of credibility for the ward committees).

Nevertheless, ward committees, if their functioning is improved, present an existing structure which could be used to enable CBA. The use of which, brings to the fore the importance of political CC champions, as ward councillors (politicians) were found to enable/hinder ward committee success

(they chair ward committee meetings and are responsible for ensuring that ward committee issues are taken up at a higher level, i.e. at Council meetings) (Smith, 2008). All four of the case study municipalities' CC work was driven primarily by the administrative structure of the municipality; political buy-in being garnered in certain instances. But as Pasquini et al. (2014) assert, political leaders have the ability to cause even greater change than their administrative counter-parts. I raise the potential for ward committees to play a role in enabling local government planned CBA, but caution that certain requirements are needed before this can occur. These prerequisites are that: (a) political CC champions are present, which would require that CC becomes an issue driven by political parties (however Smith [2008] critiques ward committees for being too partisan); (b) the functioning of these committees is improved; and (c) they receive the resources and training to be able to enable CBA, which is where the partnership approach is useful. Point (c) is important to note, not just in relation to the potential for ward committees to contribute towards CBA, but in general. To enable true participation, i.e. community engagement and two-way knowledge sharing, does not just require significant financial resources and time, but also specialised skills, which municipal officials, partner organisations, ward committee members and/or politicians may or may not have (e.g. facilitatory skills, see Section 4.3.3.2).

The fourth option is the most transformational in nature, and would call for significant changes in the way that local government operates, to enable CBA that is community-led, bottom-up and empowering, and that deals with the root causes of vulnerability. To achieve this, will require that the vested interests of institutions and power relations that create conditions of vulnerability are questioned and adjusted (which constitutes transformational adaptation according to Bahadur & Tanner, 2014). This option would require going beyond incremental adaptation that involves an extension of existing actions and dealing with symptoms (Kates et al., 2012), not root causes (Handmer and Dovers, 2009), and would require significant amounts of will, time and resources, to change how an organisation like local government operates. Further, this is particularly challenging because local government is nested within provincial and national government structures (see Figure 3.3): *"municipalities implement policies directed from higher levels of government through regulations, earmarked funding, and information"* (Dannevig et al., 2013, p. 3). It is difficult to envision exactly what changes will be required and what will be necessary to bring about these changes. This is a challenge for transformational initiatives in general, which is perhaps what attracts stakeholders to the more palatable ideas of resilience and incremental change (see Section 2.3.2). Transformation is likely to require a visionary/visionaries and/or a revolution to take place.

The solution to this conundrum will likely need to draw on all four options. There is the need for those operating within the research and NGO fields to better understand the local level and real world

challenges that government officials face in being able to implement interventions that embody ideals difficult to adhere to under existing contextual and organisational situations. There is also the need for municipal officials to become more aware and explicitly acknowledge the conceptual underpinnings of their work, as these underpinnings influence what municipalities do (see Section 11.3.1). One way of working towards improved mutual understanding between municipal, research and NGO stakeholders is via the co-production of knowledge, discussed in Section 6.6.1.2 and in Section 8.9.1 in relation to the CoCT's CC Think Tank. Both non-governmental and governmental stakeholders stand to benefit from the co-production of knowledge, as diverse skill sets and perspectives deepen the knowledge produced, grounding it in theory and practice. What municipalities do and how they do it, either endorses or questions existing power relations; power being a key component in perpetuating or alleviating community vulnerability. In summary, there is no one model or path to scaling out CBA (Gogoi et al., 2014)… as always with adaptation, context is key.

11.3. PRACTICAL AND RESEARCH RECOMMENDATIONS FOR MUNICIPAL ENABLED CCA AND CBA

11.3.1. Engage with underlying conceptual framings

The enablers discussed in Section 10.4 provide pointers as to the kinds of conditions that need to be created to get CCA work progressing in municipalities, but when one considers CBA specifically, then additional issues, as discussed in Section 11.2, need to be considered. Conceptual issues of what is meant by CCA and CBA, and how CCA and CBA interventions are different to good development, are important in shaping what is done, why it is done, and who stands to benefit from the interventions. In reality what was found in the case study municipalities is that CCA and mitigation agendas and options were often mixed, as local government officials attempt to navigate the relatively new area of municipal intervention relating to CC. Due to the pressing developmental needs of the municipalities investigated adaptation options that were more focused on vulnerability/development as opposed to responding to specific CC impacts were often favoured (see Section 2.3.1 where I discuss McGray et al.'s (2007) continuum of CCA and Section 2.3.2.1 where Eakin et al.'s (2014) specific and generic capacity are discussed).

Exploring the conceptual base/framings used is essential, especially when social justice is of importance, which is the case in South African municipalities that exist within a context of past and present injustices (see Section 3.4). What municipalities do, and how they do it, is influenced by a multitude of factors that are not just based on resource availability, but perceptions, values, norms, and context. Framing matters; how municipalities frame what they do affects what they do and how

they do it (see Section 10.2). Engaging with these framings, whether implicit or explicit to municipal practices, and investigating alternative framings via training and engagement with other stakeholders will likely enrich municipalities' ability to plan robust and sustainable interventions that take CC into account.

My research has not only brought to the fore the need for municipalities to engage with the conceptual framings of CCA, but also challenges what is understood to constitute CCA within adaptation theory. The municipalities that I investigated could not implement CCA interventions unless they incurred benefits beyond adaptation to CC (see Section 10.4.4), leading one to question whether they were conducting 'true CCA', or business-as-usual labelled as CCA. What this in fact brings to the fore is the need for greater research and theoretical enquiry into what 'CCA' is or should be, particularly because there are so many different definitions of adaptation, and whether how it is defined in the literature, is applicable in the real world. Like is discussed in Section 11.2.1 in relation to CBA, greater levels of research and enquiry needs to be undertaken to investigate if the delineation of CCA from development in theory and practice is a useful endeavor, and if so, how this could be done, when both generic and specific capacity needs to be built (see Section 2.3.2.1, and consider McGray et al.'s [2007] contribution in Section 2.3.1).

11.3.2. Conduct further research on social barriers and enablers for the development of engaged officials and enabling organisational environments

Cognitive, normative and discursive barriers - perceptions, behavioural norms and worldviews - were found to often underlie other barriers. These social barriers influence what knowledge is accepted, what is prioritised, what agenda is pursued (Section 10.2), and therefore where and how resources are disbursed. All of this strongly influences two of the most crucial enablers: how enabling officials operate within their organisational environments (Section 10.4.1); and the establishment and maintenance of networks and partnerships (Section 10.4.2). These social barriers require greater attention if we are to overcome the crux issues which are hindering the implementation of CCA and CBA. This issue was highlighted by E 1, who indicated that more research is needed on perceptions of CC within developing countries. Vignola et al. (2014) concur, indicating that little is known about public understandings of CC in developing countries, with most of this research having been conducted in Europe and North America[141]. There are exceptions though; work has been done in this regard in China (see Zhou, Hauger, Liu, & Lu, 2014), Costa Rica (see Vignola, Klinsky, Tam, & McDaniels, 2014), and Africa (see Maddison, 2007).

[141] Large scale public opinion surveys have been conducted in developed countries in Europe, as well as in the United States of America, Canada and Australia (Wolf & Moser, 2011).

Even less understood than public perceptions (see Haque, Yamamoto, Malik, & Sauerborn, 2012; Maddison, 2007; Vignola et al., 2014; Wolf & Moser, 2011), are the perceptions and social underpinnings adhered to by government officials and leaders within all sectors that have the ability and means to enable radical change in short periods of time. Understanding these social underpinnings would benefit from in-depth, ethnographic research, as a means of delving into the crux issues that may not be revealed in survey type research. There are two main challenges to this type of work being undertaken. The first is that ethnographic research requires significant time investment to build the trust needed to get to nub-issues, and to be able to engage in the multiple informal interactions that would contribute to this understanding. The second is that it would require that these 'high-level' individuals are willing to openly share their values, perceptions and discourses. They would need to allow researcher(s) to spend significant portions of time within their often sensitive working environments, and invest their own time in interacting with researcher(s). Nevertheless, this kind of research will be vital in determining ways to overcome barriers to CCA and CBA, which will be sustained.

Understanding the perceptions, social underpinnings and *modus operandi* of municipal officials that enable CCA (engaged officials), is an area of research which needs more attention and could be particularly useful in enabling CCA (see Section 10.4.1). E 1 concurred, adding that it is also important to understand how these engaged officials interact socially within their organisational environment and with partnerships and networks. Further discussion with E 1 led to the realisation that there are a number of areas that need investigation: (a) we need to better understand what the personality characteristics of engaged officials that drive CC work are; and (b) better understand how networks (both formal and informal) operate to enable CC work, despite difficult circumstances. Once we better understand these two things, and in relation to my research focus and rationale (Chapter 1), we need to find ways to attract enabling individuals to municipalities and keep (and encourage) presently engaged officials. Developing ways in which they can be harnessed to contribute to the field of municipal enabled CBA will likely require that enabling officials within municipalities are exposed to the value of CBA and its principles in pursuing social justice and sustainable development objectives, which will simultaneously improve the performance and functioning of municipalities.

As articulated by E 1, we also need to seek out ways in which the organisational environment, in this case: municipalities, provides incentives and opportunities for municipal employees to develop the characteristics of engaged officials, i.e. developing new ways to tackle problems, establishing networks and building cross-sectoral relationships (e.g. by attending knowledge stimulating events). Developing mechanisms for mentorship will also be essential, so that engaged officials transfer their skills and knowledge to others. Lastly, documenting the lessons learnt when 'early starter'

municipalities (like the four case study municipalities in this research) have tackled CC, and then developing ways to institutionalise these learnings, will be vital in ensuring that innovation moves beyond engaged officials to creating an innovative organisation.

11.3.3. Learn from pilot projects

The two community-level projects investigated revealed strongly that municipal planned CC projects at the community level, within contexts where socio-economic and developmental challenges are significant, benefit from supplying ancillary benefits that manifest in the present. Ensuring these near-term benefits, while considering long-term phenomena like CC, is a key component of projects with ancillary benefits. The RSCP and the BCRP are what Gogoi et al. (2014, p. 1) call *"laboratories of innovation"* and provide multiple opportunities for learning. The work happening in municipalities, such as the four I investigated, needs to be profiled, so that these lessons can be effectively utilised by others, improving how mainstreaming, as well as up- and out- scaling[142] of CCA and CBA occurs. However, the context-specificity of CCA, and even more so of CBA, counters the direct application of a working model in a new area (Rossing et al., 2014). This being said, both the BCRP and the RSCP have elements of out-scaling, as defined by Gogoi et al. (2014): (a) expanding the geographic area of the intervention(s); (b) local action inspiring national planning and action; and (c) other local actors learning from the interventions. Both the BCRP and the RSCP have been expanded beyond the initial pilot projects, both have been recognised at the national level (the BCRP at an international level), and both have been visited by and inspired other local actors.

11.3.4. Learn from other disciplines

To enable further up- and out-scaling of CCA and CBA will require learning from other disciplines. Many of the challenges municipalities face in taking up CCA and CBA, were likely experienced when sustainable development first became an important consideration for government in SA. Community based natural resource management and community-based disaster risk management, as practices that have similarities to CBA and have been around for longer, can also offer useful learnings (Reid & Schipper, 2014). These practices/approaches have faced the same challenges as CBA in relation to there being multiple definitions and conceptual understandings of what they mean, and thus how they are implemented (Reid & Schipper, 2014).

The contextualisation of what CBA means, presented in Chapters 1 and 2, was thus an essential first step in my study. None of the municipalities I investigated have explicitly said that they are or have conducted CBA. The two community-level projects investigated in EM and CHDM, adhered to some,

[142] Up-scaling involves horizontal transfer of an initiative and out-scaling involves vertical transfer of an initiative (Sova et al., 2012).

but not all of the CBA principles (see Section 11.2). Nevertheless, investigation of the barriers and enablers in operation in all four of the case study municipalities, have provided a useful understanding of why it is so difficult for municipalities to enable CCA, and especially CBA that is truly bottom-up, participatory and community-led. Furthermore, this is likely an even greater challenge for municipalities that have not experienced the enablers discussed in each of the case study chapters (see Section 10.4). Hence, most CBA interventions remain within the NGO realm, as Wisner et al. (2014, p. 173) state: *"CBA at the time of writing remains an acceptable part only of international NGOs and civil society practice, with some minor uptake by some United Nations agencies and government agencies (e.g. in Bangladesh)".* Nevertheless, local government has an important role to play in enabling CBA (see Sections 1.2, 2.4.8 and 11.2.1). Therefore, we need to investigate ways in which municipalities can engage with the practice of CBA, and that, in part, is what I have sought to do.

11.3.5. Learn from other municipalities

Interestingly, despite the different contexts of the four case study municipalities, and in comparison with studies in developing countries (see Chapter 4) and in developed countries, I found that when municipalities embark on adaptation work, they tend to face similar barriers and enablers. This realisation does not undermine the crucial role that context plays in any adaptation endeavour, but counters the initial thinking that I had, that there would be stark differences in the barriers and enablers experienced in resource-poor and resource-rich municipalities. Pasquini et al. (2013, p. 225), who investigated barriers in Western Cape municipalities, made a similar finding, and stated that:

> *These numerous barriers are not significantly different to those encountered so far in municipalities of the developed world, suggesting that across the globe there are common problems that national and provincial governments need to address in order to mainstream CCA at the local level (such as changing planning and other laws by which local governments operate in order to recognise CC impacts).*

I was struck by the similarities between my case study findings and the barriers experienced in Australia (see Mukheibir et al., 2012) and Norway (see Dannevig et al., 2013), and the enablers discussed by Carmin et al. (2012) and Pasquini et al. (2014) (see Section 10.4.5.2). For example, in Norway, Dannevig et al. (2013) found that there are no clear signals from national government on CCA, and hence municipalities are required to include CCA on their own agendas if they want to address it. They also found that when CCA was brought onto the agenda, it competed with other pressing and legally binding tasks, like health and education. The same issues were discovered in the SA municipalities I investigated (Section 10.3.3), with the degree of these competing and urgent priorities perhaps more extreme, due to the significant contextual challenges of developing country

municipalities (Section 10.3.4). As articulated by CoCT 1 in the feedback session:

> *For most people in the city... they are kind of like climbing Mount Everest's everyday… in first world countries, local governments have probably got to the peak of mount Everest and they are able to look out at the view and say what they'd like to do in 30 years' time… We don't have that luxury…*

Future research that explores the similarities and differences between developed and developing country municipalities and resource-rich and -poor municipalities, could pave the way for partnerships across contextual and resource divides. These collaborations, where different perspectives and skills are brought to the table, are more likely to lead to the discovery of innovative solutions. Any municipality, regardless of where they are on their CC journey has something to offer our understanding of what enables or disables municipal planned CCA and CBA. Hence, the flow of CC knowledge and experience needs to not only move between communities and government in a two-way fashion, as CBA advocates, but also between resource-poor and -rich municipalities and 'late starter' and 'early starter'[143] municipalities.

11.3.6. Develop top-down/bottom-up approaches for CCA and CBA

As was discussed in Section 10.2 there is a need to balance top-down/bottom-up approaches for CCA and CBA. Municipalities and communities require support from provincial, national and international entities, in relation to knowledge, financial and human resources. However, this support must not come with restrictions, rules and regulations that hinder context-specific and innovative practices. Balancing top-down and bottom-up approaches will contribute to improved multi-level governance, which Sánchez-Rodriguez (2009 as cited in Revi et al., 2014) argue assists in developing CCA strategies. Learning-by-doing (Section 6.8.2) within the constantly evolving fields of municipal CCA and CBA is a fundamental enabler that must be encouraged by organisations at higher tiers. To achieve this balance between top-down and bottom-up approaches, will likely necessitate the development of innovative means of monitoring and evaluating CCA and CBA, to ensure that objectives are met and money spent wisely, but also allowing for the necessary flexibility needed to learn-by-doing (see Section 10.3.4). Allowing the freedom to be able to learn from mistakes is difficult within resource-constrained environments, and is similar to the example given in Section 4.3.3.1, where community members would rather practice what they know and trust, as they face significant risks if new agricultural practices fail (D'Agostino & Sovacool, 2011). To develop these systems will require greater collaboration between stakeholders operating at community, local, provincial, national and

[143] Terms used by Carmin et al. (2012).

international levels. Thus providing increased impetus to overcome the barrier of lack of inter-governmental collaboration (see Section 10.3.2).

11.3.7. Build stronger partnerships and networks between municipalities and communities

Partnerships and networks between municipalities, NGOs and research institutes were found to be essential enablers in overcoming knowledge, human resource and financial barriers (Section 10.4.2). But these partnerships and networks need to be expanded and deepened between municipalities and civil society/communities for CCA and CBA that truly takes community knowledge, needs and aspirations into account. At the moment, as revealed in the four case studies, mechanisms for these fine-scale interactions do not yet exist (Section 10.4.1), but I offer some suggestions as to how they could be enabled in Section 11.2.2. Engaging at this level will face challenges, as participatory work with heterogeneous communities is a long and arduous process, that is not actively encouraged under existing discursive (i.e. the top-down approach) and funding conditions, which focus on the achievement of targets and 'bang for your buck'. What is required is a fundamental shift in what is prioritised, which includes recognising: (a) the value of participatory work, despite the significant resource investment needed; (b) that solutions need to provide benefits in the long- as well as the short-term (which requires greater recognition of the importance of anticipatory interventions); an (c) that the process of adaptation is just as important as the outcomes of adaptation. At the heart of all three of these priorities is social justice, which calls for the recognition of transparent participation, acknowledgement of the impact of decisions across space and time for all sectors of society, and ensuring that processes followed are fair and just (see Section 1.4.3 and Adger & Nelson [2010], Paavola & Adger [2002], and Pelling [2011]). This social justice lens is of particular important to adaptation in developing countries, where rapid urbanisation is creating sprawling informality and increasing inequality (Watson, 2009), and the tasks of municipalities are becoming more and more complex as they are often required to manage wealthy urban centers, poverty stricken informal settlements and rural hinterlands.

11.4. FINAL COMMENTS

As per my research questions and objectives, this study has investigated what barriers and enablers are experienced when municipalities engage in CCA work, and what this means for CBA. The conceptual framing of barriers and enablers has proved useful for investigating what challenges and opportunities exist when municipalities embark on CCA. At the core of this research is the acknowledgment that local government has a vital role to play in ensuring that the world's most vulnerable communities are able to adapt to CC. The four municipalities investigated have provided

many lessons in relation to what hinders and/or enables CCA and CBA work to be planned and implemented by municipalities. These lessons have relevance for both practitioners and researchers, by advancing the knowledge on how CCA and CBA can be practically applied in the municipal context, as well as contributing to the theoretical and conceptual progress of these two fields, in relation to local government. My experience in working with municipal officials has revealed that despite seemingly insurmountable challenges, there are numerous passionate and driven individuals (engaged officials), who when convinced of the benefit of an approach, in assisting poor and vulnerable communities to cope and adapt to climate variability and change, drive this approach despite difficult circumstances. There is thus hope for a new era of municipal CCA work, which may include CBA within its suite of approaches, particularly if municipal officials are exposed to how CBA can assist them in fulfilling their core mandates. Developing country municipalities are responding to the call for CCA at the local level, and I look forward to following the progress of all four of the case study municipalities' CC work.

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