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TECHNICAL REPORT

BUILDING URBAN RESILIENCE TO CLIMATE CHANGE

A REVIEW OF SOUTH AFRICA



March 2018

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Cover Photo: [Armand Hough](#), 2014, A child surveys the flood damage from heavy rainfall in Squalo, an informal settlement near Cape Town.

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United States Agency for International Development

Climate Change Adaptation, Thought Leadership and Assessments (ATLAS)

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ACRONYMS

ACCAI – African Climate Change Adaptation Initiative
BAAM – Business-Adopt-a-Municipality Initiative
BCMM – Buffalo City Metro Municipality
CCA – Climate Change Adaptation
CCVA – Climate Change Vulnerability Assessment
CHDM – Chris Hani District Municipality
COP – Conference of Parties
CSAG – Climate Systems Analysis Group
CSIR – Council for Scientific and Industrial Research
DBSA – Development Bank of Southern Africa
DEA – Department of Environmental Affairs
FBS – Free Basic Services
GCF – Green Climate Fund
GDP – Gross Domestic Product
GEF – Global Environment Facility
GF – Green Fund
GIZ – German Development Agency
ICLEI – Local Governments for Sustainability
IDP – Integrated Development Plan
IPCC – Intergovernmental Panel on Climate Change
LTAS – Long Term Adaptation Scenarios
NAP – National Adaptation Plan
NAS – National Adaptation Strategy
NDMC – National Disaster Management Centre
NGO – Nongovernmental organization
NIE – National Implementing Entity
SACN – South African Cities Network
SALGA – South African Local Government Association
SANBI – South African National Biodiversity Institute
SAWS – South Africa Weather Service
UNFCCC – United Nations Framework Convention on Climate Change

EXECUTIVE SUMMARY

South Africa has an established, robust and transparent governance structure that includes well-defined national, provincial and municipal jurisdictions, with government entities at each level whose responsibilities are codified in law and regulation. This framework creates a solid foundation for municipal governance and service delivery to residents and commercial enterprises. However, South African municipalities face substantial challenges to maintaining and improving municipal governance as the country continues to address apartheid-era economic, spatial, political and social inequities while simultaneously facing the global rural-to-urban migration trend and its implications for basic service delivery and overall economic development. These challenges are compounded by increased climate change risks such as rising temperatures and increased frequency of extreme events such as droughts, floods and storm surges.

This assessment examines the legal and regulatory environment, intergovernmental coordination, information generation and information sharing, climate change adaptation (CCA) capacity (and urban management capacity more generally), and financial resources and financial mechanisms available in South Africa to address urban CCA priorities.

KEY FINDINGS

- South Africa has taken several steps toward addressing climate change; this response has mostly been led at the national level, with some larger metropolitan municipalities (metros) also playing a major role.
 - In 2011, South Africa developed the seminal [National Climate Change Response White Paper](#) and is currently working on a [National Adaptation Strategy \(NAS\)](#) – known internationally as a National Adaptation Plan (NAP).
 - Many large metros and other large municipalities are integrating adaptation into their plans and practices.
 - Smaller municipalities, on the other hand, are primarily dealing with day-to-day issues of providing basic services and do not have the capacity to get ahead of new challenges like CCA, which requires long-term planning. This is particularly challenging given that officials are elected to five-year terms.
- While national-level climate information is rather robust in South Africa, adding local detail to make that information actionable at the municipal level is a challenge, particularly for smaller municipalities with limited climate change expertise.
- The climate change function is often placed within a municipality’s environmental department, which can be a barrier to broader integration and acceptance of CCA within municipal planning and implementation.
- In the absence of a well-established institutional framework for CCA to date, municipalities demonstrating the greatest success in this area have been guided by local climate change champions who have established networks, garnered support from other municipalities and national government, and found creative financing mechanisms.

- Local climate change planning and policy documents are often developed by consultants, resulting in generic conclusions and recommendations that are difficult to put into action (and limit the ability of municipal staff to update plans and other management documents).
- Municipalities often lack the training, access to information, incentives or financing options to turn strategies or plans into action.
- Knowledge-sharing platforms and city-to-city mentoring can increase the flow of lessons learned and successful approaches among cities. South Africa's metros are very active in global networks, such as C40 and ICLEI (Local Governments for Sustainability).
- Climate change is often seen as an "unfunded mandate" in South Africa; all levels of government are mandated through national policy to act on climate change, yet funding allocations thus far do not seem to reflect this imperative.
- A significant barrier to municipalities providing their own funding for CCA is the fact that many municipalities are already functioning at a revenue deficit and struggling to provide basic services. This leaves them little room for financing climate change actions unless those actions clearly satisfy basic services or other priorities.
- Several climate funds supported by international donors are active in South Africa, with multiple institutions accredited as National Implementing Entities (NIEs); however, many municipalities are unable to develop the detailed proposals required by these funds.

OPPORTUNITIES FOR ENGAGEMENT AT THE LOCAL LEVEL

1. **Improve the availability and accessibility of climate information tailored to the specific and priority needs of municipalities**, and assist municipalities to use climate information to undertake risk and vulnerability assessments that produce actionable strategy and planning documents. Of critical importance to work in this area is framing of climate information in ways that resonate with elected political leaders in municipalities, making those leaders into advocates for long-term adaptation planning and action.
2. **Support an integrated approach to CCA within municipality planning and budgeting processes.** This could take the form of facilitating interdepartmental workshops to 1) educate all departments on climate change risks and impacts (sharing the results of a climate change vulnerability assessment (CCVA), for example) and 2) work toward buy-in from all departments to CCA objectives by demonstrating convincingly that climate risk presents a real and immediate threat to service delivery and that addressing it will improve the resilience of municipal services. This initiative would also assist in breaking down institutional silos that tend to exist around climate change, and by educating municipal personnel in the science of climate change and its practical implications would help create CCA champions within the municipality.
3. **Harness best practices and lessons learned to scale those experiences.** The great majority of the CCA action at the municipal level thus far has been concentrated in the largest metros, notably eThekweni (Durban and surrounding area), Tshwane (Pretoria and surrounding area), Johannesburg and Cape Town. The financial and technical comparative advantage enjoyed by these municipalities must be actively used to disseminate good practices, adapting them 1) to the contexts in other municipalities and 2) to the resource challenges faced by other municipalities. Interventions should emerge

from well-thought-out CCVA and climate change response strategies. Projects should have socioeconomic (ideally short-term) benefits beyond just responding to climate risks (to satisfy the incentive structure imposed by short-term election cycles and garner easy wins) as well as try to leverage local, national or international “targets of opportunity” (a local drought or a high-level event) to increase local buy-in and support.

- 4. Support municipalities to identify and access finance that can be used for climate action.** Entry points for assisting municipalities to access finance will differ depending on the municipality’s size, in-house technical capacity and financial readiness. In all cases, the long-term challenge of improving the evidence base of climate risk and vulnerability, and linking identified risks and vulnerabilities to budgeting (and ultimately, integration into the normal planning and budgeting process), must be a core objective to make adaptation sustainable. In addition, among larger, better-capacitated metros, assistance might take the form of supporting a bond issuance or developing proposals aimed at accessing international climate financing. Mid-size municipalities might not have enough capacity to put together a proposal for debt or grant funding from international sources but could aim for funding from the South African Green Fund or support from bilateral donors. Smaller municipalities have fewer options for accessing external funding, but with support from external stakeholders with greater capacity, they can build their own capacity incrementally. One possibility is twinning smaller municipalities with a metro located in their province to create a mentoring relationship that includes provision of technical expertise, taking the form of formal and informal training and occasional advisory services.

INTRODUCTION

South Africa is extremely vulnerable to the impacts of climate variability and climate change. Changing weather patterns and rising average temperatures are increasing the frequency and intensity of dry spells and droughts, creating major water security challenges, improving conditions for veld and forest fires, and endangering agricultural livelihoods. In coastal areas, sea level rise and more intense storms imperil infrastructure and the communities it supports. These challenges directly and indirectly impact South African cities, particularly where they combine with other factors like rural-to-urban migration, continued reconfiguration of urban areas to undo apartheid-era segregation, and poor service delivery. These factors combined put substantial pressure on municipalities to deliver basic services and catalyze economic growth.

South Africa has capacity, experience and a range and intensity of activity addressing climate change. To date, mitigation has been the strategic focus of policy articulation, funding and activity on the ground. However, adaptation is increasingly seen as a priority at all levels of government. At the national level this is evidenced by the creation of a designated unit focused on adaptation within the Climate Change and Air Quality Branch of the Department of Environmental Affairs (DEA) as well as ongoing development of the first National Adaptation Strategy (NAS). At the local level, capacity and funding remain largely limited to identify, plan for and implement climate change adaptation (CCA) actions (the exception being larger metros such as Durban and Cape Town, which have become leaders in climate change action), but awareness of the impacts of climate change is widespread and local governments are keen to find ways to integrate CCA considerations into their planning and finance functions.

The following sections include: 1) an overview of the institutional environment and mechanisms for municipal service delivery; 2) a summary of climate change policies, institutional actors and projects at national and local levels; and 3) an analysis of building blocks for CCA at the local level.

Information for this assessment was collected from a desk study and field work. In the field, researchers met with national-level stakeholders, donors and research institutes, as well as with representatives from three municipalities: City of Tshwane, Buffalo City Metropolitan Municipality (BCMM), and Chris Hani District Municipality (CHDM). More information on the municipalities can be found in Annex A and a full interview list in Annex B.

SECTION 1. OVERVIEW OF INSTITUTIONAL ENVIRONMENT

South Africa has an established, robust and transparent governance structure that includes well-defined national, provincial and municipal jurisdictions, with government entities at each level whose responsibilities are codified in law and regulation. This governance structure is supported by a cadre of government-supported and private sector organizations that provide technical, institutional development and public engagement support to complement core government services. This framework creates a solid foundation for municipal governance and service delivery to local residents and commercial enterprises that could be applied to respond to climate risks. However, South African municipalities face substantial challenges to maintaining and improving municipal governance as the country continues to address apartheid-era economic, spatial, political and social inequities while simultaneously facing the global rural-to-urban migration trend and its implications for basic service delivery and overall economic development. These challenges are compounded by increased climate change risks such as rising temperatures and increased frequency of extreme events such as droughts, floods and storm surges.

To provide context for climate change response at the municipal level in South Africa, this section is an overview of the levels of governance within South Africa and how municipalities deliver basic services and earn revenue (and the challenges therein).

1.1 LEVELS OF GOVERNANCE

South Africa's government consists of national, provincial and local (municipal) levels of government that each have legislative and executive authority in their own spheres and are defined in the Constitution as "distinctive, interdependent and interrelated." National and provincial government entities must not "interfere or encroach upon the institutional integrity" of local government as outlined in sections 4B and 5B of the Constitution (legislative and executive powers of municipalities) (Chauke 2016).

South Africa has 9 provinces and 278 municipalities: 8 metropolitan (Category A), 44 districts (Category C) and 226 local (Category B). District municipalities consist of several (usually 4–6) local municipalities. Metropolitan municipalities are not included in district municipalities (SACN 2014a).

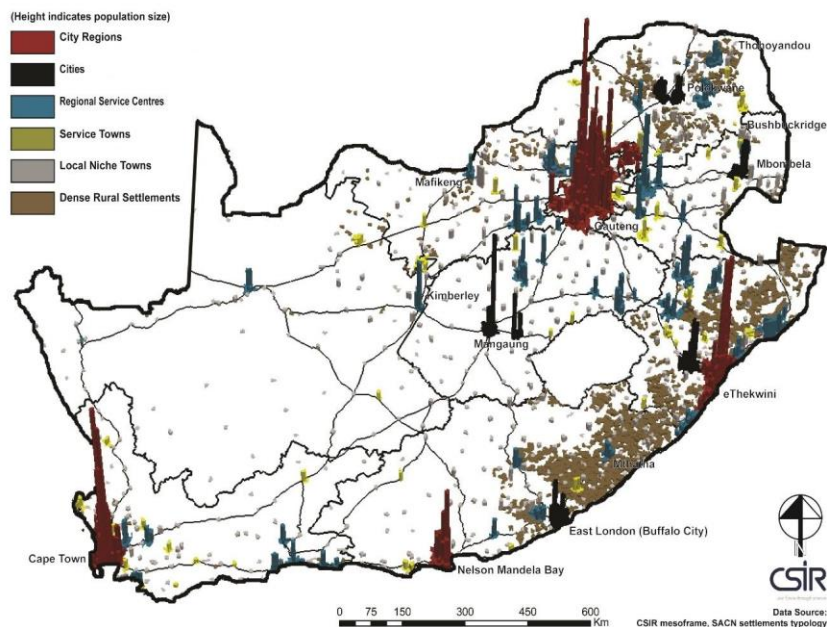
The executive and legislative authority of a municipality is vested in its municipal council. Municipalities each have an elected council that decides policy, development

Typology of Cities

The Council for Scientific and Industrial Research (CSIR) developed a typology to map the spatial distribution of cities, towns and settlements; it is meant to represent the functional role that cities and towns play in their regional contexts, not a mere hierarchical calculation of population and/or economic production or services. See Figure 1 for more information on the typologies.

plans, service delivery plans and annual budgets. Metropolitan municipalities have a mayor and mayoral committee that coordinate council and municipal department activities. Municipalities prepare an Integrated Development Plan (IDP) every five years. The IDP is revisited and adjusted each year (South Africa’s fiscal year runs from July 1 to June 30), along with the development and approval of an annual budget.

Figure 1. Typology of cities in South Africa



This figure is a map of South Africa that shows the different typology of cities, ranging from City Region to Dense Rural Settlements. Source: CSIR.

1.2 MUNICIPAL SERVICE DELIVERY AND REVENUE

Under the South African Constitution, local government is mandated with regulatory and service provision functions, including approval of developments and other land/built environment modifications and provision of basic services such as electricity, water, sewerage and sanitation, storm water management, and fire prevention and firefighting services.

In 2000, the government announced that it would implement a Free Basic Services (FBS) policy to ensure a basic level of water, sanitation and electricity to poor households that could not afford to pay for them. FBS expanded over the years and now includes water, energy/electricity, sanitation and refuse removal. While national guidelines exist on how municipalities should target delivery of FBS (service-level versus consumption-based), who qualifies as indigent (monthly household income lower than \$117), and the amount of FBS households should receive (Figure 2), the specifics of implementation are left to the discretion of the local municipality (SERI 2013).

As of 2016, almost 90 percent of households used piped water, 63 percent used flush toilets, 64 percent received refuse removal services, and 87 percent had access to electricity. However,

these figures mask a lot of variation across provinces and between local municipalities. Households living in rural municipalities usually have access to far less, and usually inferior, services than those living in wealthier, urban municipalities (STATSA 2016).

Figure 2. Minimum standards for Free Basic Services

<i>Minimum Standards for FBS</i>	
Water	25 litres per person per day or 6 kilolitres (kl) per household per month within 200m of a household (legislated in regulations published in terms of the Water Services Act – see section 3.1.1 below);
Sanitation	Safe, clean, hygienic and reliable toilet facility e.g. a Ventilated Improved Pit (VIP) latrine or waterborne sanitation. If a household is connected to the sewer then 3 to 4 kl extra FBW per month should be provided for flushing (see section 3.1.2 below) ¹⁷
Electricity	50 kWh per household per month for grid connected households and up to 80% subsidy on the monthly operating fee for non-grid systems e.g. home solar systems (see section 3.1.3 below); ¹⁸
Refuse Removal	Most appropriate level of waste removal service based on site specific circumstances (see section 3.1.4 below); ¹⁹

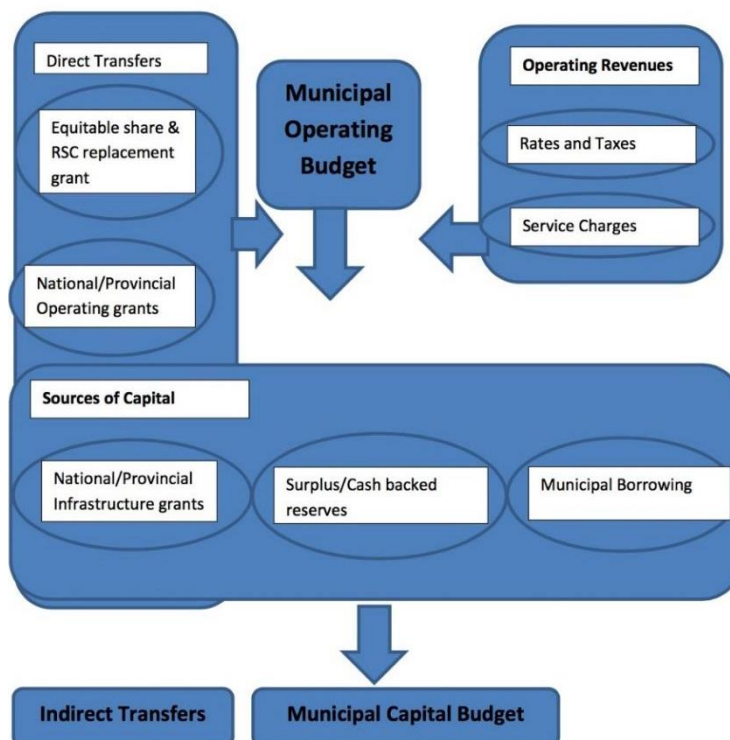
Source: SERI 2013.

Municipalities rely on two main sources of revenue: 1) municipal fees, rates and tariffs; and 2) intergovernmental transfers (Figure 3). Urban municipal budgets tend to be majority municipal-generated revenue while rural municipal budgets are majority intergovernmental transfers (Chauke 2016). Municipally generated revenues include property taxes, user fees for services and other local taxes. Municipalities have the right to finance their affairs by charging fees for services and imposing surcharges on fees, rates, levies and duties. Interestingly, sale of electricity to local residential and commercial customers is a substantial revenue source for municipalities. The national electricity utility, Eskom, provides generation and transmission, and municipalities provide distribution to customers. The municipal council has the responsibility to implement and adopt tariff policies (section 75A of the Municipal Systems Act).

Other revenue streams for municipalities include:

- The [Department of Cooperative Governance and Traditional Affairs](#) administers the [Municipal Infrastructure Grant](#) targeted at eliminating infrastructure backlogs and ensuring basic services provision (water, sanitation, roads, community lighting).
- In 2007/08, nationally collected taxes were 95.6 percent of total South African tax revenue (or 27.8 percent of gross domestic product [GDP]). Provinces were just under 1.0 percent (0.2 percent of GDP) and local government was around 3.6 percent (1.0 percent of GDP) (National Treasury 2008).
- Equitable share allocations are primarily intended to supplement municipal funding for FBS and most go to municipalities that have high numbers of households requiring FBS.

Figure 3. Fiscal framework to fund municipalities



This figure shows the funding framework of municipalities. Most municipalities source revenue from operating revenues (rates, taxes and service charges) and direct transfers (national grants). Source: National Treasury 2012.

1.3 CHALLENGES TO MUNICIPAL SERVICE DELIVERY

From a structural standpoint, South African municipalities are well-positioned to provide leadership and deliver services to their residents, particularly in comparison to municipalities in most other sub-Saharan African countries. However, the dynamics driving demographic and land use trends at the municipal level are putting tremendous pressure on municipalities. The dual challenges of global movement of people from rural agricultural livelihoods to urban centers and continued dismantling of apartheid-era residential and commercial organizational patterns have left many municipalities unable to provide the required infrastructure and services. These challenges are compounded by climate stressors such as floods and droughts that are increasingly putting pressure on municipal service delivery. These climate and non-climate challenges are described in more detail below.

CLIMATE STRESSORS

Increasingly, droughts and floods, along with rising temperatures and sea levels, are presenting new challenges for municipalities (see Table 1 for climate trends and projections). For example, the Western Cape has been struggling with one of the worst droughts to hit the region in one hundred years, severely limiting water supplies in urban areas. Under a drier future scenario, water resource scarcity is likely to hit the central, northern and southwestern regions,




constraining development and forcing tradeoffs between agricultural and urban/industrial use (DEA 2013a).

Future flood risk is likely to increase across the entire country, but particularly in KwaZulu-Natal, the Eastern Cape and Limpopo (DEA 2016a). In May 2017, over 100 mm of rain fell in Durban within a 24-hour period – leading to devastating flooding that forced evacuations and caused damage to homes, cars and infrastructure (Davies 2017). Increased flood risk is also likely to increase the incidence of waterborne diseases common in South Africa, such as cholera, dysentery, typhoid and other rotavirus infections (DEA 2011b).

Coastal cities such as Cape Town, Durban and Port Elizabeth are at risk from rising sea levels that could impact important economic sectors such as tourism (DEA 2016a). Rising temperatures can lead to increased heat-related human health risks such as heat stress and respiratory illnesses; this is particularly true for large cities prone to the urban heat island effect.¹

Settlement patterns often determine the level of risk communities face. For example, communities living in crowded urban and peri-urban areas with no or limited access to safe water supplies and sanitation are at particular risk from waterborne diseases. Densely populated informal settlements are often built with low-quality housing materials in areas with poor drainage such as wetlands or on sand dunes in coastal areas, leaving households extremely vulnerable to flooding and other extreme weather events (DEA 2011b).

Table 1. Historical and future changes in climate in South Africa

Climate Parameter	Observed changes since the 1960s	Projected changes in climate by 2050
Temperature 	<ul style="list-style-type: none"> • Increase in average annual temperatures by at least 1.5 times the global average. • Increase in maximum and minimum daily temperatures in almost all seasons. 	<ul style="list-style-type: none"> • The coast is likely to warm by around 1–2°C and the interior by around 2–3°C. • Increase in temperature extremes and heat waves.
Rainfall 	<ul style="list-style-type: none"> • High interannual variability. • Annual rainfall trends are weak overall, but the tendency is toward a significant decrease in the number of rain days in almost all hydrological zones. • This implies a tendency toward an increase in the intensity of rainfall events and increased dry spell duration. 	<ul style="list-style-type: none"> • A risk of drier conditions to the west and south of the country and a risk of wetter conditions over the east of the country. • Many of the projected changes are within the range of historical natural variability, and uncertainty in the projections is high. • Greater frequency of extreme rainfall events.
Sea Level Rise 	Sea levels are rising by: <ul style="list-style-type: none"> • 1.87 mm per year on the west coast • 1.47 mm per year on the south coast • 2.74 mm per year on the east coast 	<ul style="list-style-type: none"> • Continued rise in sea levels. • Modelling has shown that some areas along the coastline will be more susceptible than others, but the understanding is incomplete.

Source: DEA 2013a and DEA 2011b.

¹ An urban heat island is an urban or metropolitan area that is significantly warmer than its surrounding rural areas due to human activities.

NONCLIMATE STRESSORS

Financial constraints. The demand for and ability of municipalities to provide basic services is heavily influenced by the income distribution of households within each municipality. Municipalities with large populations of poor households are likely providing FBS to a majority of households, thus they are not able to collect revenue for providing this service (STATSA 2016). Municipalities with the highest poverty headcount rates are concentrated in the Eastern Cape, Kwazulu-Natal, and Limpopo Provinces (STATSA 2014). These municipalities are highly dependent on government transfers and unable to prioritize standard operations and maintenance of service delivery.

Table 2 is an example of an annual budget from a municipality in the Eastern Cape for 2010–2011 and highlights these challenges. Government grants and subsidies comprised 71 percent of the municipality’s income, while revenue from property rates and service charges, which should be the municipality’s primary source of income, represented only 23 percent of total income. Repairs and maintenance expenditure was only 1 percent of total costs (van der Mescht and van Jaarsveld 2012). Limited municipal capacity to collect revenues has also been cited as a problem for maintaining municipal budgets; nonpayment by households, businesses and government entities is often related to inadequate municipal billing systems (Chauke 2016).

Table 2. Income-expenditure table of a local municipality for 2010–2011

Income - Expenditure Statement for Financial Year 2010/11		
Revenue		
Item	Amount	Percentage of total revenue
Property rates	R 7,943,164.00	8.23%
Service charges	R 14,554,633.00	15.08%
Rental of facilities & equipment	R 157,991.00	0.16%
Income from agency services	R 1,465,002.00	1.52%
Fines	R 287,493.00	0.30%
Government grants & subsidies	R 68,754,069.00	71.25%
Other income	R 1,337,956.00	1.39%
Interest on investment income	R 1,990,845.00	2.06%
Total revenue	R 96,491,153.00	100.00%
Expenditure		
Item	Amount	Percentage of total expenditure
Personnel	R 20,888,317.00	24.42%
Remuneration of councillors	R 2,041,502.00	2.39%
Depreciation & amortisation	R 8,863,221.00	10.36%
Impairment loss	R 13,904,894.00	16.26%
Finance costs	R 153,700.00	0.18%
Collection costs	R -	0.00%
Repairs and maintenance	R 931,978.00	1.09%
Bulk purchases	R 1,743,535.00	2.04%
Contracted services	R 1,538,154.00	1.80%
Grants and subsidies paid	R 26,721,068.00	31.24%
General expenses	R 8,753,328.00	10.23%
Total expenditure	R 85,539,697.00	100.00%
Surplus	R 10,951,456.00	

Source: van der Mescht and van Jaarsveld 2012.

Urbanization and internal migration. South Africa is highly urbanized relative to other sub-Saharan African countries, with about 65 percent of the population living in cities. However, the annual urbanization rate is only 1.3 percent, which is lower than that of many developing countries. For comparison, Tanzania is 33 percent urbanized, with a 5 percent urbanization rate (CIA 2017). Historical and current patterns of urbanization are complex and nuanced. Under apartheid, controls were imposed to suppress black urbanization, effectively fracturing the physical form of cities (Turok 2012). Townships were purposefully isolated from economic opportunities, forcing the black population to live in the urban periphery, far from facilities, good services and job opportunities (Landman 2010).

After the end of apartheid, these controls were withdrawn, resulting in an increase in internal migration and urbanization over the past few decades. Internal migration flows to cities are unsurprisingly from rural to urban areas, and increasingly between and within urban areas. Gauteng City Region (which includes Pretoria and Johannesburg) and Cape Town have the highest migration inflows. Cities are the target for many incoming migrants; as a result, urban populations exploded between 2001 and 2011, growing by more than 25 percent (SACN 2016).

However, fragmentation in urban areas is still prevalent, with harmful social, economic and environmental consequences. For example, historical development favored road-based transport – private cars and minibus taxis – making commutes expensive and time-consuming for the urban poor (Turok 2012). High unemployment rates in cities (averaging around 25 percent nationwide, but as high as 33 percent in cities like Nelson Mandela Bay) and lack of affordable housing force many migrants to settle in former black townships and informal settlements, creating additional pressure on municipal service delivery (SACN 2016). The average residence period within urban informal settlements increased from about two to four years in the early 1990s to ten years currently (National Planning Commission 2015).

Today “spatial transformation” is an ongoing effort to bring basic services (e.g., electricity, water and sanitation, public transport, education, policing) to these areas to integrate them into the larger municipal fabric. However, this process is costly and fraught with political complication.

Immigration from other countries. Long seen as a hub for economic opportunity, South Africa attracts immigrants from across the continent, most of whom set their sights on the cities, making transboundary migration a major trend and a significant municipal challenge. The most recent numbers come from the 2011 census, which counts 2.2 million immigrants to South Africa (around 6 percent of the population).² These numbers have only increased in recent years, especially from neighboring Zimbabwe, where political and economic challenges are substantial migration drivers (Wilkinson 2015). Similar to internal migrants, people coming from other countries usually find it difficult to secure housing and employment in the urban core, leading many to settle in informal housing on the outskirts of town.

Informal settlements and housing. Tied to the apartheid legacy and recent large immigration flows, informal settlements are growing rapidly within municipal jurisdictions, where residents

² <https://africacheck.org/reports/do-5-million-immigrants-live-in-s-africa-the-new-york-times-inflates-number/>

illegally access basic services like electricity and water, reducing overall service quality and increasing costs to utilities and paying customers. Municipalities face politically and financially difficult decisions about how and when to regularize informal settlements and/or formally extend services to them. Extending services to informal settlements increases the legitimacy of the settlements themselves, thereby forcing the hand of the municipality in terms of regularizing land use.

Further densification of informal settlements and established townships occurs through a practice known as backyarding, where informal dwellings are built in backyards. From 2001–2011, the number of households living in backyard dwellings *within established townships* increased by 55 percent, while the number of freestanding shacks in outlying squatter areas actually declined. Densification of informal housing within townships and in outlying areas exacerbates the challenges described above with regard to accessing and paying for services like electricity and water (Borel-Saladi and Turok 2015)

SECTION 2. SOUTH AFRICA'S RESPONSE TO CLIMATE CHANGE

South Africa has taken several steps toward addressing climate change; this response has mostly been led at the national level, with some larger metros leading the way in terms of policy and action. This section provides an overview of policies, institutional actors and projects at both the national and local level. More detail and analysis about what this actually means at the local level are in Section 3.

2.1 NATIONAL-LEVEL RESPONSE

NATIONAL POLICIES

South Africa ratified the United Nations Framework Convention on Climate Change (UNFCCC) in August 1997 and the Kyoto Protocol in 2002. South Africa's 2000 [Initial National Communication](#) to the UNFCCC catalyzed efforts in CCA. In 2004, the country developed its first national climate change response strategy and the following year it hosted a national climate change summit, integrating the work of scientists and policy makers. In 2011, South Africa developed the seminal [National Climate Change Response White Paper](#), which defines the government's vision for effective climate change response and transitioning to a climate-resilient, low-carbon economy. The white paper views local government as critical in building climate resilience through planning development, municipal infrastructure and services, water and energy demand management, and local disaster response (DEA 2011a). Publication of the white paper coincided with publication of South Africa's [Second National Communication](#) to the UNFCCC.

South Africa is currently working on a [National Adaptation Strategy \(NAS\)](#) – known internationally as a National Adaptation Plan (NAP). The NAS is meant to standardize adaptation planning and help align sectoral plans (for example, the National Climate Change Health and Adaptation Plan 2014–2019 or the currently in draft Climate Change Response Strategy for Water Resources). Urban areas are considered in conjunction with coastal and rural settlements in the NAS, and no specific strategy currently exists for adaptation in urban settlements (as there is for rural areas and planned for coastal areas). However, the NAS does include a few recommendations that are relevant for urban adaptation, such as:

- Develop guidelines for and implement retrofitting of existing housing settlements to build adaptive capacity, including, for example, through rainwater tanks and composting toilets.
- Integrate ecosystem-based adaptation (installing green roofs, increasing urban vegetation, etc.) within rural, urban and coastal settlements to enhance resilience and support livelihoods and health.

- Identify and implement decentralized energy, water and wastewater systems in rural and urban settlements that are more resilient to projected climate change impacts.
- Maintain an effective public transport system, including maintenance of infrastructure for road, rail and nonmotorized transport. In this context, climate change resilience can be improved through optimal spatial planning and transformation of central business districts and urban hubs through effective transport links and activity corridors.

Climate change is also integrated into larger development plans, such as the [National Development Plan](#), which provides a vision and plan to 2030. This plan identifies climate change as a major factor that will influence the context in which South Africa operates, however the impact of climate change on urban areas is not directly addressed. The focus is limited mostly to mitigation efforts and transition to an environmentally sustainable, low-carbon economy (National Planning Commission 2015).

NATIONAL INSTITUTIONAL ACTORS

The [Department of Environmental Affairs](#) (DEA) leads climate change action nationally through the [Climate Change and Air Quality Branch](#). A dedicated CCA unit is currently driving several programs focused on increasing city and municipal resilience to climate change. It is also leading development of the NAS. Several other line function national departments like the Department of Agriculture, Forestry, and Fishery and the Department of Water and Sanitation are responsible for integrating climate change into their policies and programs. Some of the key institutions working on climate change include:

- [National Disaster Management Centre \(NDMC\)](#) (under the [Department of Cooperative Governance and Traditional Affairs](#)) works closely with DEA on climate change coordination, policy and processes as well as the South Africa Weather Service to provide short-term climate forecasting. It distributes hazard risk profiles (tsunami, cyclones, etc.) every three months and conducts quarterly meetings with stakeholders at the National Disaster Management Stakeholders Forum. Box 1 presents more information on disaster management in South Africa.
- [South Africa Weather Service \(SAWS\)](#) provides short-term climate forecasts for both energy and agriculture clients (mainly commercial to date, although it hopes to provide products like text messages for smallholder farmers). SAWS coordinates closely with the NDMC on an early warning system. It provides access (currently for a fee) to historical climate records. In March 2017, SAWS released the [Climate Change Reference Atlas](#), which provides spatial projections of rainfall and temperature.
- [South African National Biodiversity Institute \(SANBI\)](#) leads and coordinates research, and monitors and reports on the state of biodiversity in South Africa. SANBI is important in the CCA space as it is an accredited National Implementing Entity (NIE) for both the Adaptation Fund and the Green Climate Fund (GCF).

- [National Treasury](#) facilitates the Division of Revenue Act, which provides for an equitable distribution of nationally raised revenue between national, provincial and local government; it also monitors the implementation of provincial budgets. The National Treasury implements the Cities Support Program (Section 1.3) and is tasked, along with the Economic Development Department and DEA, with developing a climate finance strategy, including policy and financing mechanisms (according to the National Climate Change Response White Paper).

Finding the Policy Link: Disaster Risk Management and Climate Change Adaptation

Source: DEA 2016(b)

It is important to recognize the role of disaster risk management in CCA, particularly in South Africa, which has some of the most advanced institutional frameworks for disaster risk management in the world, such as the Disaster Management Act (2002) and the National Disaster Management Policy Framework (2005). This legislation establishes intergovernmental structures and a policy framework for managing and funding disaster risk and response and requires each level of government to establish structures to ensure that disaster risk reduction, response and recovery are coordinated and implemented; included in this is the mandate for all three levels of government to conduct disaster risk assessments.

The Disaster Management Act, as amended in 2015, refers to climate change and the responsibility of national, provincial and local government to “provide measures and indicate how it will invest in disaster risk reduction and CCA, including ecosystem and community-based adaptation approaches; develop early warning mechanisms and procedures for risks identified in its functional area; and regularly review and update its plan.”

SCIENCE AND RESEARCH (BOTH NATIONAL AND SUBNATIONAL)

The country supports a well-established earth system science research program that is important for developing climate change scenarios for southern Africa. Some research on climate change risk exists, but additional research is needed, particularly for cities and the built environment. A group of South African scientists is well-integrated into international climate change research and the government has prioritized improving evaluation of adaptation measures. Leading research institutions for climate change include:

- **Council for Scientific and Industrial Research (CSIR)** is a research and development institute established through an Act of Parliament in 1945. CSIR has a range of [competencies in climate change](#), including climate modeling, carbon cycle of ocean systems, and ecosystem dynamics in the context of global change. CSIR is [developing Africa's first Earth System Model](#), which will be an input into the sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC), as well as [adaptation guidelines](#) for various types of human settlements in South Africa that are at risk because of climate change (see Green Book project below).
- **Climate Systems Analysis Group (CSAG)** is based at the University of Cape Town and operates one of the few empirical downscaled models of the whole of Africa; the model simulates responses to global climate change at a growing number of meteorological station locations across the African continent. The web portal is the Climate Information Portal and can be found at www.cip.csag.uct.ac.za.
- **University of Stellenbosch** is a member of the [African Climate Change Adaptation Initiative \(ACCAI\)](#) and hosts the [Research Alliance for Disaster Risk Reduction' \(RADAR\) program](#) (formerly DiMP), widely regarded as Africa's most experienced disaster risk reduction capacity development and research center.

- **University of Witwatersrand**, also a member of ACCAI, established a [Global Change Institute](#) that has climate change as a core research theme. The institute is partnering with the city of Johannesburg to work on developing long-term and short-term plans to develop a resilient city in the face of climate variability and climate change.

CENTRALLY-LED PROJECTS

South Africa has made enormous strides in understanding climate change and variability across the country through projects such as:

- The [Long Term Adaptation Scenarios \(LTAS\)](#) project, which developed national and subnational scenarios to support climate-resilient development planning, and released a [report on urban and rural settlements](#) in 2014. The outcomes of these assessments led to different cross-sectoral scenario adaptation plans, as well as adaptation programs and projects that are being implemented. The LTAS project was led by DEA, in collaboration with technical partner SANBI and technical and financial assistance from the German Development Agency (GIZ).
- [South Africa Risk and Vulnerability Atlas](#) – developed by the Department of Science and Technology and CSIR – is a spatial portal that allows users to visualize vulnerability, exposure and environmental hazards within a particular location.
- [Green Book project](#) is a four-year project (March 2016–March 2019) funded by the Canadian International Development Research Centre and implemented by CSIR. The Green Book will include:
 - Downscaled projections for 2030, 2050 and 2100 at an 8x8km grid
 - Hazard mapping – floods, droughts, fires, sea level rise, etc.
 - Vulnerability profiling – population growth, demographics, economy, etc.
 - Risk profiles – exposure of cities (vulnerability) to the identified climate-related hazards
 - Adaptation response spatial plans for all South African municipalities, presented in a cost-benefit analytical framework

Other centrally led projects aim to build the capacity of local governments to respond to climate change (see Table 3 for a summary):

- The Local Government Climate Change Support Program is supported by GIZ, DEA and the [South African Local Government Association \(SALGA\)](#). The main activity is the [Let's Respond Toolkit: integrating climate change risks and opportunities in municipal planning 2012](#), which was developed to build local and provincial government capacity to address climate change. The toolkit supports local government to integrate climate change response in integrated development plans and sector planning. The toolkit has been rolled out in six of the nine provinces, with the remaining three to be completed by spring 2018.
- [Cities Support Program](#) is a legislatively mandated program administered by the National Treasury. One component (of four) is aimed at assisting eight metros in scaling climate work by identifying public finance that can be used for mainstreaming climate resilience across infrastructure-related sectors. CCA is seen a critical to the program's objective of spatial transformation – that is to normalize land use, basic services and demographic patterns, unwinding the apartheid-era townships model.

- Cities Resilience Program is driven by DEA and eight metros and supported by ICLEI (Local Governments for Sustainability), the National Treasury and the South African Cities Network (SACN), among others. It is primarily a knowledge-sharing platform that sponsors conferences and workshops. The program has started focusing on secondary cities as the link between metros and secondary cities is becoming more important.

Table 3. Summary of national-level climate change projects

Name	Donor and implementer	Product	Capacity/governance	Technical	Coverage
Long Term Adaptation Scenarios (LTAS)	DEA, GIZ and SANBI	Assessment and scenario planning		X	Nationwide
South Africa Risk and Vulnerability Atlas	Dept. of Science and Technology, CSIR	Spatial portal for viewing vulnerability, etc.		X	Nationwide
Green Book project	CSIR	Assessment and scenario planning		X	Nationwide
Local Government Climate Change Support Program	GIZ, DEA and SALGA	Let's Respond Toolkit	X		All district municipalities
Cities Support Program	National Treasury	Integration of CCA financing into planning	X		Metros only
Cities Resilience Program	DEA with partner support	Knowledge-sharing platform	X		Metros only (some focus on secondary cities)

2.2 PROVINCIAL- AND MUNICIPAL-LEVEL RESPONSE

Subnational Policies

Strategies and plans vary widely at the provincial level; every province has at least a vulnerability assessment or climate change plan (although many are still in draft form). Similar to national strategies, there is no dedicated analysis of urban adaptation. Urban settlements are usually considered in conjunction with rural settlements, with some urban themes integrated into transport, energy and infrastructure sections. Some examples include:

- *Eastern Cape*: [Climate Change Response Strategy](#) (2011)
- *Western Cape*: [Climate Change Response Strategy](#) (2014)
- *Limpopo*: [Climate Change Adaptation Strategy](#) (2015)

At the municipal level, strategies and plans vary from advanced plans and actions such as those developed by Cape Town and eThekweni to rudimentary vulnerability assessments done by smaller local municipalities. Below are the experiences of some of the metros in developing policies and institutions to drive their climate change work.

- **Durban (eThekweni Municipality)** has been a leader in climate adaptation since 2004 when it initiated a [Municipal Climate Protection Program](#) to mainstream climate change considerations. The municipality's [Environmental Planning and Climate Protection Department](#) has led considerable work to understand climate risk and implement responses, including developing 16 work streams called [Municipal Adaptation Clusters](#) that were [evaluated](#) for comparative costs and benefits. Durban went through several iterations of adaptation planning (i.e., Headline CCA Strategy in 2006 and sector adaptation plans– water, health, and disaster management– in 2009); in 2014, the municipality approved the [Durban Climate Change Strategy](#), which defines a citywide approach to CCA and mitigation. At the UNFCCC Conference of Parties (COP) 17 in Durban, the [Durban Adaptation Charter for Local Governments](#) was launched, committing signatories to climate action in their jurisdictions.
- **Cape Town's Environmental Management Department's** Environmental Planning and Sustainability Branch is responsible for implementing the city's climate change efforts. The city adopted a [Framework for Adaptation to Climate Change in the City of Cape Town](#) and an [Energy and Climate Change Strategy](#) in 2006. It also established an Energy and Climate Change Committee supported by an Executive Management Team Subcommittee on Energy and Climate Change to address adaptation and mitigation. The city first included adaptation in its 2007/08–2011/12 municipal IDP. City planning, particularly related to water, has used climate change scenarios developed by the [University of Cape Town's CSAG](#). In 2010, an alliance of public sector, business, academia and civil society organizations established the [Cape Town Climate Change Coalition](#). The city contributed to and is guided by the [Western Cape Provincial Climate Change Response Strategy](#).
- **City of Tshwane (Pretoria)** developed the [Tshwane Vision 2055](#) roadmap for a low-carbon, resource-efficient and climate-resilient city and a [Green Economy Strategic Framework](#) (2013) identifying adaptation and mitigation actions and ultimately plans to create an integrated climate change response strategy. In 2014, the city drafted a [Vulnerability Assessment to Climate Change](#). The city established a [Sustainability Unit](#) to guide the city's sustainable development and climate change-related efforts. The Sustainability Unit drafted a Sustainable Financing Mechanism strategy to support green economy efforts and launched an Outreach Program, called [Tshwane Green](#), to raise public awareness.
- **Johannesburg** has an [Environment and Infrastructure Services Department](#) responsible for [addressing climate action](#). There is a mayoral subcommittee on climate change and a Johannesburg Climate Change Coordinating Committee chaired by the director of the Environment Department. In 2009, the city developed a [Climate Change Adaptation Plan](#) including sectoral vulnerability assessments. The year 2009 also brought the Soweto flash floods that affected more than 650 families, left two dead, and cost an estimated \$42 million for flood response. This event catalyzed a somewhat more coordinated, multilevel and multisectoral approach to disaster risk management in the city (McNamara 2013). The city has a relationship with the [Clinton Climate Initiative](#), which

has provided a range of technical assistance, and in 2014, the city hosted the first [C40 Cities Climate Leadership Group Mayors Summit](#) held in Africa.

SUBNATIONAL INSTITUTIONAL ACTORS

The South African Constitution mandates an autonomous association of municipalities to represent local government to Parliament, the National Council of Provinces and provincial legislatures. Known as SALGA ([South African Local Government Association](#)), this association provides advice and support for local government through policy analysis, research and monitoring, and knowledge exchange. SALGA has an Environment Management and Climate Change specialist under the Municipal Infrastructure and Services Directorate who coordinates closely with DEA and other partners to promote CCA work at the local level.

Networking and knowledge sharing are important components to advancing the climate change agenda at the local level. For the large metros, the [South African Cities Network \(SACN\)](#) is an established network of South African cities and partners that encourages exchange of information, experience and best practices on urban development and city management. SACN includes a [sustainable cities](#) theme which had a focus area on [climate change](#), supports a [local government program on climate change](#), and published a [local government response to climate change](#) with mitigation and adaptation sections. The 2016 [SACN State of Cities Report: Toward Resilient Cities](#) discusses governance, sustainability, the need for municipalities to address climate change, and more. For any size municipality, [ICLEI](#) is a leading global network of more than 1,500 cities, towns and regions committed to building a sustainable future. In South Africa, 18 municipalities (local, district and metro) are members.

SUBNATIONAL PROJECTS/ACTIONS

National climate change research and risk assessment efforts support urban adaptation work but little direct funding or capacity-building support is available for municipalities, which have mainly begun integrating adaptation through their own initiatives. Table 4 provides a few examples of city-led initiatives, with more analysis and detail provided in Section 3.3.

Table 4. Examples of city-led climate change initiatives

Durban	Cape Town	City of Tshwane	Johannesburg
<ul style="list-style-type: none"> • Reforestation for ecosystem services • Development of an integrated climate impact assessment tool and a sea level rise tool • Community adaptation planning, including water harvesting • Coastal and estuary management planning • Reductions in water use and loss 	<ul style="list-style-type: none"> • Climate-related research and studies commissioned • Early warning systems • Flood risk reduction measures – stormwater drainage system • Floodplain and river corridor management policy • Adaptation awareness raising among communities 	<ul style="list-style-type: none"> • Green building bylaws • Conduct of a vulnerability assessment • Local action biodiversity wetlands and community project 	<ul style="list-style-type: none"> • Mapping of flood-prone areas • Development of early warning systems • Awareness raising of climate risk in vulnerable communities • Integration of CCA plan recommendations into long-term city strategy and day-to-day operations

SECTION 3. BUILDING BLOCKS FOR CLIMATE CHANGE ADAPTATION AT THE MUNICIPAL LEVEL

When it comes to CCA, most local-level governments are aware of the impacts of climate change and acknowledge action is needed to respond; however, many municipalities are operating under severe financial constraints, with numerous competing priorities. To better understand what is needed to move climate adaptation work forward, this section identifies challenges and opportunities for CCA at the local level. The framework for this section is based on the USAID building blocks for effective, climate-resilient development: 1) Improving the availability, quality and use of weather and climate information; 2) Mainstreaming adaptation measures into governance, planning and budgeting; 3) Piloting and disseminating risk-reducing management practices; and 4) Mobilizing finance for adaptation measures from multiple sources.

3.1 IMPROVING THE AVAILABILITY, QUALITY AND USE OF WEATHER AND CLIMATE INFORMATION

Climate information, such as historical trends and future projections, is key for improved decision making and urban planning at all levels of government. Information must not only be available but needs to be easily accessible and understandable by stakeholders. When available, this information can be integrated into resilient infrastructure design standards, zoning regulations, and coastal management, land use and disaster risk reduction planning. This section gives an overview of the current status of climate information in South Africa, including production, accessibility and usability at the local level.

Identifying climate trends and projections – Climate information is relatively well-developed due to the work of research institutions like CSIR and CSAG as well as government ministries like SAWS and DEA. In terms of historical trends, SAWS maintains a relatively robust historical climate record for the country; 1,000 manual stations and 200 automatic stations operate around the country, with 25 stations designated as “climatic stations” that represent a diverse set of climate zones across South Africa (SAWS, onsite interview, May 2017).

Future climate projections are well-researched and developed for South Africa. Box 2 shows the progression of climate modeling for the country, culminating in the LTAS in 2013. The LTAS project was in response to the South African National Climate Change Response White Paper and undertook CCA research and scenario planning for South Africa and the southern Africa subregion. DEA led the process in collaboration with technical research partner SANBI as well

as technical and financial assistance from the GIZ. In March 2017, SAWS released a Climate Change Reference Atlas that includes downscaled projections, while CSIR is downscaling projections across the entire country for the Green Book project.

Progression of climate change scenarios for South Africa

Source: DEA 2013(b)

1990s: The South African Country Studies Programme developed a series of climate projections (including a simple interpolation of global climate models and statistically downscaled projections) in preparation for South Africa's Initial National Communication for submission to the United Nations Framework Convention on Climate Change (UNFCCC).

2003: South Africa released its first Initial National Communication.

2003–2007: Modelling approaches developed extensively internationally, including improved representation of oceanic influences on global and regional climates. In South Africa and the broader region, downscaling methods were applied far more extensively than before.

2007: Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) was released in 2011, South Africa released its Second National Communication with statistical downscaling of AR4 results.

2011–2013: Higher resolution dynamic and statistical downscaling of IPCC AR4 results was developed over southern Africa, using mainly A2 and B1 emissions scenarios.

2013: Fifth Assessment Report (AR5) of the IPCC was released with a new set of emissions scenarios and global climate scenarios developed by the international community.

2013: LTAS (phase 1): Future climate trends were simulated over southern Africa using both statistical and dynamic downscaling of the output of AR4 (A2 and B1 emissions scenarios) and AR5 (RCPs 8.5 and 4.5), representing unmitigated (A2 and RCP8.5) and mitigated (B1 and RCP4.5) future energy pathways. In addition, a pattern scaling method using a two-dimensional atmospheric model of the MIT Integrated Global System Model was used that employed 450ppm CO₂ stabilization as a mitigated scenario, contrasted with an unmitigated pathway. Four fundamental climate scenarios were developed for South Africa nationally, and further elaborated at subnational level, up to 2050 and beyond.

2017: SAWS released the Climate Change Reference Atlas.

2019 (*estimated completion date*): CSIR's Green Book will provide downscaled projections for 2030, 2050 and 2100 at an 8x8km grid.

Determining accessibility and usability – The extent to which this historical and future climate information is accessed and used for planning purposes varies.³ While it is possible to access historical climate records from SAWS, doing so currently requires a processing fee, which limits the use of information to mainly commercial clients and large research institutions (SAWS, onsite interview, May 2017). While a user might be able to access information related to climate trends and planning from an open source online portal (such as [this one](#) by CSAG for climate trends or [this one](#) by CSIR for spatial trends), navigating, and much less interpreting, the complex information is limited by the highly technical nature of the information and corresponding high level of technical experience required to use it. The SAWS Climate Change Reference Atlas has a number of updated projections, but little to no interpretation of the

³ Based on interviews and review of literature. It is beyond the scope of the assessment to identify with certainty the uptake and use of these documents.

projections for policy makers, while project managers for the Green Book are still trying to work out the best way to get the information into the hands of policy makers. These climate information challenges are typical worldwide but nevertheless merit specific mention for South Africa, given its high vulnerability to climate variability and change and its status as a regional leader in climate-related analysis and action.

While national-level climate information is rather robust in South Africa, adding local detail to make that information actionable at the municipal level is a challenge, particularly for smaller municipalities with limited CCA expertise. For example, in both the CHDM and BCMM, climate change strategies were developed within the past few years, but these documents were not based on an assessment of risk or vulnerability; thus, the documents are relatively generic and not given much credibility (CHDM and BCMM, onsite interviews, May 2017).

Making information useful at the local level – The LTAS project made a concerted effort to present climate information in a useable format designed for policy makers. The climate information and related adaptation scenarios were distilled into a series of easy-to-read factsheets. While use and uptake of the LTAS was not the focus of this assessment, it does seem to have provided the foundation for programs like the Local Government Climate Change Support Program, which uses various products such as the [“Let’s Respond Toolkit”](#) (which educates local government officials on basic climate change science and provides an overview on how to integrate climate change into the municipal planning process) and the [“Vulnerability Assessment Tool”](#) (which provides stakeholders with a step-by-step process for conducting a Climate Change Vulnerability Assessment [CCVA]).

In the case of the Let’s Respond Toolkit, users are provided with a list of resources and climate portals to consult to obtain more information on climate change trends and projections for their region. Access to information and understanding what that information means for policy decisions are two different processes, which the toolkit acknowledges: “Climate science is complex. While these sites are worth exploring, the information often remains difficult for laypeople to understand and analyze correctly” (DEA 2012). The toolkit then directs municipalities to obtain direct assistance from CSAG in compiling a region-specific climate information report. While the report is a good starting point for municipalities, the language is technical and the uncertainty over future climate projections is made clear. Even CSAG cautions that the report “is a summarized overview of the observed climate and future climate projections and should serve as a starting point in exploring climate vulnerabilities and impacts. The information presented here should not be used as the sole source of information in adaptation planning or decision making. Further sources of information and guidance should be obtained” (DEA 2012).⁴

In the case of the Vulnerability Assessment Toolkit, users are directed to various sources for information to identify exposure, sensitivity and adaptive capacity to climate change. These sources include the LTAS reports, online mapping tools, or other technical or government data that are directly linked within the tool. While the tool could be used at the local level, the

⁴ An example of a climate report produced by CSAG is found in Tool 7 (pg. 40) of the “Let’s Respond Toolkit.”

information seems most suited to provincial-level assessment as the level of downscaling varies between indicators and sources and some technical capacity is needed to understand the reports/data and identify the local impacts (if localized information is available at all).

OPPORTUNITY FOR ENGAGEMENT AT THE LOCAL LEVEL

The main opportunity under this building block in South Africa is improving the availability and accessibility of climate information tailored to the specific and priority needs of municipalities, and assisting municipalities to use climate information to undertake risk and vulnerability assessments that produce actionable strategy and planning documents (i.e., building on the Let's Respond framework). Of critical importance to work in this area is framing of climate information in ways that resonate with elected political leaders in municipalities, making those leaders advocates for long-term adaptation planning and action.

3.2 MAINSTREAMING ADAPTATION MEASURES INTO GOVERNANCE, PLANNING AND BUDGETING

While South Africa's Constitution designates authority to municipal governments to manage their administration, budgeting and planning processes, poor communication and coordination between 1) national and local and 2) provincial and local levels of government constrain local adaptation planning. This challenge is exacerbated by a lack of financial and technical adaptation support for municipalities from national government. This section explores progress to date in terms of mainstreaming CCA into the IDP process, the incentives (or lack thereof) for local officials to prioritize climate change adaptation, the difficulty of integrating CCA into existing government processes, and the importance of municipal-level political commitment and support for CCA integration.

Mainstreaming CCA into IDPs – Although local governments receive limited financial or technical support from the national government to undertake CCA, evidence suggests that a number of large metros and other municipalities are integrating adaptation into their plans and practice (Ziervogel et al. 2014). This is particularly true for larger cities – Cape Town and eThekweni were among the first cities to include climate change actions in their IDPs. In these cases, action on climate change began before the legislative decision to require it as a strategic priority in IDPs, and this prior work undertaken at the municipalities' initiative appears to have greatly facilitated mainstreaming. For example, Cape Town adopted an Energy and Climate Change Strategy in 2006, established an Energy and Climate Change Committee to support the strategy and developed specific adaptation response strategies before including climate change considerations in its 2007/08–2011/12 IDP (Parramon-Gurney and Gilder 2012). Larger municipalities, assuming political commitment, tend to have the advantage of greater financial and technical capacity to take the initiative to address emerging threats and opportunities, including those presented by climate change.

Smaller municipalities, on the other hand, are primarily dealing with day-to-day issues of providing basic services and do not have the capacity to get ahead of new challenges like CCA, which requires long-term planning that incorporates the uncertainty and complexity inherent in assessing and effectively targeting climate change.

Challenges of Integrating CCA into the IDP Process

Source: CDKN 2012

- Concerns over the implementation and effectiveness of IDPs and a lack of confidence in the instrument itself.
- The difficulty associated with undertaking the foundational work necessary to achieve strategic mainstreaming and securing the necessary financial and political support for such work.
- A fundamental disconnect between the long-term nature of adaptation investment and the short-term nature of elected terms of office.
- Lack of relevant technical and other capacity and poor awareness of the importance of climate change responses by local government.
- Uncertainty over the mandate of local government to respond to the climate challenge.
- The difficulty of linking climate change with the local development agenda. In many instances, climate change is regarded as an issue removed from local circumstances and priorities.
- A lack of initial guidance and support from provincial and national governments.
- The need to identify climate response priorities for individual municipalities.

In the medium term, mainstreaming climate change into IDPs is important for promoting climate-compatible planning and action. The additional technical and financial challenges imposed by climate change on municipalities must be integrated into their regular processes. Key to addressing this imperative is building local government staff and sectoral capacities and using a range of other instruments, such as bylaws and sectoral plans, to facilitate or compel action on climate change (Parramon-Gurney and Gilder 2012).

Measuring “success” – Elected officials serve five-year terms, discouraging long-term thinking required for effective CCA. In South Africa, where the pressure to deliver basic services is high, elected officials may resist spending scarce municipal funds to improve the resilience of new or existing infrastructure, given that the benefits of improved resilience often will not accrue while they remain in office. So, an added challenge is demonstrating to elected officials and their constituencies that climate-resilient investments are a wise use of limited resources.

Supporting activities that do not add to (or would even reduce) a measurable outcome can be a tough sell. For example, “success” is often based on the number of housing units constructed or kilometers of road built, and does not factor in long-term infrastructure resilience to floods, landslides or other extreme climate events. Added costs that increase resilience will likely reduce the number of units that can be built, thus discouraging adaptation measures. While predominantly a climate change mitigation issue, an additional disincentive to incorporation of climate change principles into municipal planning is the fact that municipalities receive substantial revenue from the sale of water and energy to residential and commercial customers, and so have limited economic motivation to promote adaptive measures like water or energy conservation.

Finding a home for climate change action – In municipalities across South Africa, climate change technical capacity is commonly housed in the environment department, and in smaller municipalities this department often employs just one person, who also leads initiatives in

natural resources management, biodiversity conservation, waste management and air quality management. Larger, better-resourced municipalities might have a dedicated climate change position, but this usually covers both adaptation and mitigation, which require very different (although complementary) knowledge and expertise. Additionally, even when a dedicated position exists, as described in the previous section, funding constraints might leave the position unfilled indefinitely. The exception is the larger metros such as eThekweni and Cape Town, which have robust climate change departments and teams with specialized climate adaptation expertise. However, even these larger municipalities express concern over finding and attracting CCA expertise (Spires 2015).

As previously mentioned, the climate change function is often placed within a municipality's environmental department. While some technical overlap arises between environmental management and climate change mitigation and adaptation, this arrangement can be a barrier to broader integration and acceptance of CCA within municipal planning and implementation. For example, in BCMM, movement toward mainstreaming CCA began several years ago, but because it is an environment department function, there is limited understanding and acceptance (and traction) toward integration into the IDP and budgeting process (BCMM, onsite interview, May 2017). The best place for a climate change function is debatable – a centralized, high-level unit might garner more support and receive greater priority, but CCA is inherently cross-cutting and might work better as a decentralized function. Lack of a specific mandate⁵ for climate change at the municipal level also leads to uncertainty about which department should be responsible. In the near term, it is likely inevitable (and probably advantageous) for climate change expertise to be centralized. Special emphasis is needed to create the pathways for mainstreaming. In the longer term, it will be important for staff in all relevant departments to include climate expertise.

Securing a champion – In the absence of a well-established institutional framework for CCA to date, municipalities demonstrating the greatest success in this area have been guided by local climate change champions who have established networks, garnered support from other municipalities and national government, and found creative financing mechanisms. Spires (2015) found that in the four municipalities studied (eThekweni, Cape Town, Nelson Mandela Bay and Chris Hani) the primary enabler in bringing CCA onto the municipal agenda was engaged officials or CCA champions/leaders who were committed to addressing CCA in municipalities and determined to integrate it into municipal planning processes and actions. The importance of local champions is widely acknowledged in South Africa and an ongoing initiative, led by SALGA, aims to create a cadre of municipal government climate change champions (SALGA, onsite interview, May 2017).

⁵ Many of the critical climate change response actions identified in the National Climate Change Response White Paper fall within local government responsibilities, such as basic service delivery (water, electricity, waste), stormwater management, roads maintenance, sanitation, disaster management, human settlements, etc. (Let's Respond Toolkit, pg. 58). However, no specific climate change mandate is in place for municipalities.

OPPORTUNITY FOR ENGAGEMENT AT THE LOCAL LEVEL

Supporting an integrated approach to CCA within municipalities could take the form of facilitating interdepartmental workshops to 1) educate all departments on climate change risks and impacts (sharing the results of a vulnerability assessment, for example), and 2) work toward buy-in from all departments to CCA objectives by demonstrating convincingly that climate risk presents a real and immediate threat to service delivery and that addressing it will improve the resilience of municipal services. This initiative would also assist in breaking down institutional silos that tend to exist around climate change, and by educating municipal personnel in the science of climate change and its practical implications would help create CCA champions within the municipality.

3.3 PILOTING AND DISSEMINATING RISK-REDUCING MANAGEMENT PRACTICES

Developing CCA policy is a critical step toward effectively addressing the adverse impacts of climate change but translating policy into practice is often where the barriers to CCA start to emerge most clearly. In many cases in South Africa, municipal climate change strategies and plans are outsourced to external consultants based on vague scopes of work prepared by individuals lacking climate change practice depth of knowledge. The documents that emerge from this process are often generic, lacking evidence-based analysis and specific conclusions and recommendations. As discussed in other building blocks, municipalities then lack the training, access to information, incentives or financing options to turn strategies or plans into action. Despite these challenges, there are a wealth of examples of municipalities finding opportunities to implement initiatives that increase their resilience to climate change. This section highlights municipal-led projects helping communities adapt to climate change, the importance of “windows of opportunity” and ancillary benefits, and networks and knowledge-sharing platforms helping South African cities engage in CCA.

Taking the initiative – Often seen as global leaders in local CCA, Cape Town and eThekweni offer good examples of municipal-led local climate change action.

- In the City of Cape Town, a growing urban population combined with increased climate risks such as reduced rainfall, higher average temperatures, increased average wind speeds, and an increased likelihood of drought led the city to implement the [Water Conservation and Demand Management Programme](#) in 2007. Today, recycled water is used to irrigate public parks and green areas and 6 percent of all potable water is recycled. More than 4,000 households have been visited for leak detections and repairs, and 258 kilometers of water pipes have been replaced to reduce pipe bursts and water leaks. Before the program, water demand was growing at 4 percent annually; that rate has been reduced to less than 2 percent per year (C40 Cities 2017).
- eThekweni Municipality initiated a [reforestation project](#) in 2008 as a way to offset carbon from the 2010 World Cup (which the municipality was hosting). While conceived of as a “carbon sequestration” initiative, it simultaneously ensures the improved supply of a large number of other ecosystem services (e.g., water quality, flood attenuation, sediment regulation, biodiversity refuge conservation, river flow regulation) important for long-term CCA needs of local communities, as well as short-term resilience to storms

and droughts. The project is ongoing thanks to continued funding from the municipality itself and funding from the South African Green Fund (eThekweni Municipality 2011).

Seizing an opportunity while providing important benefits – The two previous examples illustrate the importance of “targets of opportunity” that spur a municipality to action. In the case of Cape Town, it was climate variability leading to dire water shortages that led to action, while in eThekweni a high-level event allowed local leaders to garner support for their cause. The eThekweni reforestation example also highlights how projects that support adaptation are not always explicitly labeled as such, but the ancillary adaptation benefits are often clear. Another example of this is the [Local Action for Biodiversity](#) program, run through ICLEI’s Cities Biodiversity Center and funded by South African National Lotteries Distribution Trust Fund. This program is engaging two metros – Tshwane and Nelson Mandela Bay – to raise local awareness and promote the sustainable use of wetlands by local governments and communities (ICLEI n.d.). Wetland restoration is often seen just within the realm of natural resources management; however, restoring wetlands adjacent to cities is key to securing a clean, reliable source of water for urban populations, particularly as the increased risk of floods and droughts is rendering many water sources unusable.

Connecting is key – Knowledge-sharing platforms and city-to-city mentoring can increase the flow of lessons learned and successful approaches among cities. South Africa’s metros are very active in several global networks:

- Seventeen South Africa municipalities are members of ICLEI, a global association of cities and local governments dedicated to sustainable development. In addition to an international network, members gain access to training, projects, webinars and conferences.
- Four metros (Johannesburg, Durban, Cape Town and Tshwane) are part of the C40’s global network of cities committed to addressing climate change. These cities can connect to C40’s 17 networks, enabling knowledge exchange, access to global expertise and connection with technical partners.
- Cape Town and Durban are part of [100 Resilient Cities](#), gaining access to financial and logistical guidance for establishing a Chief Resilience Officer, who will lead the city’s resilience efforts; technical support to develop a holistic resilience strategy that reflects each city’s distinct needs; access to an innovative platform of private sector and nongovernmental organization (NGO) services to support strategy development and implementation; and inclusion in the 100 Resilient Cities Network to share knowledge and best practices with other member cities.

Within South Africa, SACN is an important knowledge-sharing platform for metros, and is increasingly starting to focus on secondary cities, while SALGA works with all municipalities and provides advice and support for local government through policy analysis, research and monitoring, and knowledge exchange. Smaller municipalities have been less engaged in global city-to-city networks, but some (like CHDM) have their own internal climate change forums quarterly where they can share climate change information, policies and experiences with the six local municipalities (CHDM, onsite interview, May 2017).

OPPORTUNITY FOR ENGAGEMENT AT THE LOCAL LEVEL

South Africa has a wealth of experience in CCA – the key now is to harness best practices and lessons learned to scale those experiences. As noted, the great majority of the CCA action at the municipal level thus far has been concentrated in the largest of the metros, notably eThekweni, Tshwane, Johannesburg and Cape Town. The financial and technical comparative advantage enjoyed by these municipalities must be actively used to disseminate good practices, adapting them 1) to the contexts in other municipalities and 2) to the resource challenges faced by other municipalities. Interventions should emerge from well-thought-out CCVA and climate change response strategies. Projects should have socioeconomic (ideally short-term) benefits beyond just responding to climate risks (to satisfy the incentive structure imposed by short-term election cycles and garner easy wins) as well as try to leverage local, national or international “targets of opportunity” (a local drought or a high-level event) to increase local buy-in and support.

3.4 MOBILIZING FINANCE FOR ADAPTATION MEASURES FROM MULTIPLE SOURCES

Climate change is often seen as an “unfunded mandate” in South Africa; all levels of government are mandated through national policy to act on climate change, yet funding allocations thus far do not seem to reflect this. While larger municipalities such as eThekweni have been able to attract bilateral and national funds to support their climate change work and Johannesburg has issued a Green Bond, smaller local municipalities have limited options to fund climate change actions (Ziervogel et al. 2014). Funds are needed to hire and maintain staff dedicated to climate change, conduct vulnerability assessments and develop climate change strategies, prepare proposals for CCA projects (when seeking external funding), and implement climate change activities (when using internal funding). This section first describes the types of climate financing mechanisms available in South Africa (Section 3.4a) and then describes the challenges municipalities face in accessing or mobilizing those mechanisms (Section 3.4b).

3.4A CLIMATE FINANCING IN SOUTH AFRICA

Financing CCA from bilateral and multilateral funds – Several climate funds supported by international donors are active in South Africa, with multiple institutions accredited as National Implementing Entities (NIEs):

The Adaptation Fund – Established under the UNFCCC, the fund finances adaptation projects and programs in developing countries. SANBI is the country’s NIE for this fund and is currently implementing two projects in South Africa. The funding is currently capped at \$10 million, with no more funds expected in the near future (SANBI, onsite interview, May 2017). Two projects from this fund include:

- “Building resilience in the greater uMngeni catchment, South Africa” (\$7.5 million)
- “Taking adaptation to the ground: a small grants facility for enabling local-level responses to climate change in South Africa” (\$2.4 million)

Global Environment Facility (GEF) – The financial mechanism for the UNFCCC, GEF has approved 42 projects in South Africa worth \$163.8 million in grants and \$1.1 million in co-financing. To date projects have been mitigation-focused.

Green Climate Fund (GCF) – Set up within the UNFCCC, the GCF acts as a mechanism to help developing countries formulate adaptation and mitigation practices. The Development Bank of Southern Africa (DBSA), Nedbank and SANBI are in the process of being accredited as NIEs. The GCF approved a concept note submitted by SANBI entitled “Enhancing South Africa’s Community Adaptation Small Grants Facility,” which would provide at least 50 small grants to NGOs, valued at approximately \$100,000 each. This project would build on the Small Grants Facility project currently funded by the Adaptation Fund. Three district municipalities would be selected (Jennings 2017).

Other funds include (DEA 2016b) -- The United Kingdom’s International Climate Fund to help developing countries adapt to climate change, embark on low-carbon growth and tackle deforestation (active in South Africa); Germany’s International Climate Initiative, which finances and supports climate change mitigation, adaptation and biodiversity projects with climate relevance to help trigger private investments (active in South Africa); and Japan’s Fast Start Finance, which pledged \$15 billion to help developing countries achieve economic growth in ways that contribute to climate stability (active in South Africa).

Financing at the national, provincial and local levels – While no dedicated fund exists for adaptation financing at the provincial and local levels of government, municipalities can access the South African Green Fund, issue green bonds and/or identify private sector financing for adaptation.

South African Green Fund (GF) – The GF was started in 2012 with about \$100 million in funding from the Ministry of Finance and is channeled through DEA but managed by the DBSA. The GF is currently in its fifth year and has gone through three rounds of funding to support 55 projects. Most projects have been mitigation-focused, but some adaptation-oriented projects include reforestation and/or aquaculture (DBSA, onsite interview, May 2017). Only three projects have been municipality-led:

- eThekweni – Municipality Reforestation Program; \$2.8 million nonrecoverable grant
- City of Tshwane – Energy Efficient Municipal Buildings; 1-year feasibility study; \$60,000 grant
- City of Cape Town – Thermally Efficient Low-Cost Housing; \$3.8 million grant

Green Bonds – Thus far, South Africa’s experience with green bonds has been very limited. In general, mitigation is perceived to provide a more straightforward business case for green bond issuance because the type of activity proposed tends to have a clearer revenue generation stream. Investments in renewable energy generation, for example, have relatively clear demand from utilities and/or consumers. Adaptation actions, on the other hand, are a mixed bag in terms of being revenue generators. Some, like bridges and roads, lend themselves to revenue

generation through user fees. However others, like seawalls or restored wetlands, do not. In the latter case, dedicated revenue from local taxes or other municipal sources is required as part of the bond package. Two examples from South Africa include:

- Johannesburg issued the first green bond in June 2014 (to the value of approximately \$107 million), the first instrument of its nature in the local government sector and South Africa as a whole. The focus of most projects was mitigation, including low-carbon, energy, transport and infrastructure benefits.
- Cape Town issued a green bond of \$76 million in July 2017. Cape Town identified a suite of eligible projects to fund with the proceeds of the bond that are a mix of adaptation and mitigation initiatives, all of which are aligned to the city's Climate Change Strategy. Projects include procurement of electric buses; energy efficiency in buildings; and water management initiatives, including water meter installations and replacements, water pressure management, upgrades to reservoirs, sewage effluent treatment, and rehabilitation and protection of coastal structures.

The private sector in South Africa is increasingly interested in working at the local level to increase resilience to climate change. Some experiences to date include (DEA 2016b):

- The Santam insurance company, through the [Partnership for Risk and Resilience](#), partners with 12 district municipalities (comprising 54 local municipalities) to drive risk mitigation and risk reduction interventions and initiatives (see Box 4 for more details).
- Woolworths and Marks and Spencer (M&S) has engaged in similar local-level partnerships, collaborating with the World Wide Fund for Nature in South Africa and the Ceres Municipality on the Breede Catchment Water Stewardship Project to explore the water risks facing Cape agricultural producers, promote water stewardship activities and find collaborative solutions to water management in the catchment area.
- Nedbank launched the Places Programme in 2013, piloting a project in the town of Magaliesburg in Gauteng Province to improve community resilience and renew the local economy. The program currently works in a total of six towns with the goal of transforming local economies by 2020 through active citizenry and effective public-private-community partnerships.
- [Business Partners Ltd Green Fund](#) (\$23 million) finances and supports projects that impact positively on the environment while creating jobs.

Insuring against risk: a public-private partnership

Source: Ginsburg, et al. 2014

In 2009, the increased unpredictability and severity of extreme weather events in South Africa and the associated impacts on the insurance sector led Santam Ltd., the country's leading general insurer, to explore the driving factors of disaster risk and the role of the industry in reducing risk and improving municipal resiliency. In association with World Wide Fund for Nature (WWF) and CSIR, Santam selected the Eden District Municipality as a case study for analysis. This coastal region in the Western Cape Province is particularly vulnerable to extreme events including floods, droughts, wildfires and storm surges; the impacts in recent years resulted in significant economic losses for local populations, the municipal government and the insurance sector. In one five-year span alone, severe floods, storm surges and wildfires in the Eden District Municipality caused more than R1.75 billion in damages, or roughly 70 percent of the Western Cape government's direct disaster damage costs.

The findings provided a basis for establishing multistakeholder collaborative initiatives to increase resilience, such as the Business-Adopt-a-Municipality initiative (BAAM). Through BAAM, Santam entered into formal agreements with five municipalities, including Eden District Municipality, to build the capacity of municipal leaders and invest in fire prevention and disaster risk management projects. The municipalities received fire equipment and vital training that enabled significant improved capacity and response time to fires. Santam continues to collaborate with district municipalities through its Partnerships for Risk and Resilience program, and as a member of the Network for Business Sustainability South Africa, which provides a platform for businesses to discuss and learn from others involved in multistakeholder collaborations between private companies and municipalities.

While a long-term goal of BAAM and similar collaborations is that they can be successfully replicated elsewhere and on a larger scale, there is no blanket approach and each initiative requires strong governance, detailed planning and engaged communities. Santam noted in a 2014 review of the BAAM initiative that the grant-based funding model used to date would be insufficient for replicating on a larger scale, given the significant infrastructure challenge facing many municipalities, and that increased partner participation and development financing channels should be utilized to improve the scale of impact.

3.4B CHALLENGES AT THE LOCAL LEVEL TO ACCESSING CLIMATE FINANCE

Meeting day-to-day needs – A significant barrier to a municipality providing its own funding for CCA is the fact that many municipalities are already functioning at a revenue deficit and struggling to provide basic services. This leaves them little room for financing climate change actions. For example, in Tshwane, half of the municipality's population is either living under the poverty line or living in informal settlements without land tenure (and thus not paying taxes). This leaves Tshwane unable to recover costs for basic services such as water and electricity (City of Tshwane [CoT], onsite interview, May 2017). In BCMM, a climate change officer position in the department remains vacant and unfunded, reflecting the need for this technical capacity, but the lack of a way to fund it (BCMM, onsite interview, May 2017).

Inadequate procurement systems – Trying to procure goods or services to support CCA can be difficult within the current municipal procurement system. Like with many government procurement systems, when choosing a service provider priority is given to cost savings rather

than quality or skill level. This was cited by several municipalities as a hindrance to procuring qualified CCA expertise (Spirens 2015). The procurement system can even be a challenge once climate funding has been secured, as has been the DBSA's experience in attempting to disburse funds from the South African Green Fund to a municipality. Additionally, long-term contracts with organizations are difficult to maintain under the current system, which limits relationships to three years. This leads to loss of institutional memory and long-term relationships that facilitate learning (Spirens 2015).

Accessing grant funding – The bar is relatively high across the board for municipalities to obtain external grant funding for CCA initiatives. International and national climate funds require detailed proposals that provide the evidence base for the problem the funding will address and how it will be addressed. Historical weather data, downscaled climate projections, demographic trend and projection data, and narratives describing municipal capacity to effectively use funds are all required by funding entities. In addition, a municipality's ability to monitor financing, project implementation and impact must be detailed.

Issuing green bonds – If a municipality decides to structure a bond issuance to fund CCA measures, the information and analytical requirements are substantial. To make the bond attractive to potential investors, the municipality must provide comprehensive information regarding bond repayment, including detailed balance sheet data and other municipality details. The municipality must have a bond rating and that rating must be viewed by potential investors to be in line with the interest rate offered on the bond. Many municipalities simply do not have the capacity or systems required to issue a green bond. Even a large municipality like Tshwane finds it difficult to attempt a green bond due to lack of municipal-level data and historical records (CoT, onsite interview, May 2017). It is telling that of the 55 projects funded by the South African Green Fund, only 3 were led by municipalities (although all Green Fund projects require buy-in from the municipality in which the proposed activity will be implemented).

OPPORTUNITY FOR ENGAGEMENT AT THE LOCAL LEVEL

Entry points for assisting municipalities to access finance will differ depending on the municipality's size, in-house technical capacity and financial readiness. In all cases, the long-term challenge of improving the evidence base of climate risk and vulnerability, and linking identified risks and vulnerabilities to budgeting must be a core objective to make adaptation sustainable. In addition, among larger, better-capacitated metros, assistance might take the form of supporting a bond issuance or developing proposals aimed at international climate financing. Mid-size municipalities might not have enough capacity to put together a proposal for debt or grant funding from international sources but could aim for funding from the South African Green Fund or support from bilateral donors. Smaller municipalities have fewer options for accessing external funding, but with support from external stakeholders with greater capacity, they can build their own capacity incrementally. One possibility is twinning smaller municipalities with a metro located in their province to create a mentoring relationship that includes provision of technical expertise, taking the form of formal and informal training and occasional advisory services.

CONCLUSION

From drought-induced water scarcity in Cape Town to heat-related health impacts in Tshwane, it is clear that climate change is already having negative impacts on the economic growth, human health and overall quality of life in cities across South Africa. These impacts are projected to worsen as temperatures and sea levels continue to rise and floods and droughts become more frequent and intense. While there is widespread recognition of the need to respond to and prepare for these climate change risks, and a strong national framework to support action at the local level, this assessment identified resource-based challenges that are limiting local response to climate change.

These challenges – chief among them providing basic services to large numbers of immigrants and migrants creating and expanding informal settlements, and dismantling apartheid-era land use arrangements to improve economic opportunities for black townships – require more immediate, crisis-driven action, leaving municipalities with little time, energy or funding to engage in the more deliberative, orderly and longer-term planning necessary to address climate change. Further complicating action on climate change are complex municipal procurement systems, staff with limited knowledge of climate science or experience on climate change practice, insufficient funding to staff vacant climate change positions, and elected officials' reticence to allocate scarce resources to CCA measures they perceive as addressing a long-term problem beyond their elected term of office.

Despite these challenges, South Africa's relative political and economic stability and expressed high-level political will to address climate change provide clear opportunities to strengthen climate change action at the local level. At the policy level, the national government is working to develop sectoral climate change strategies that will help motivate line departments responsible for delivery of core services (and outside of those usually tasked with addressing climate change, such as environment and/or disaster management) to start integrating climate change into their strategies and plans. For example, the National Climate Change Health and Adaptation Plan 2014–2019 and draft Climate Change Response Strategy for Water Resources demonstrate climate-specific analyses and approaches that provide a framework to guide municipal health and water departments in their thinking on climate change and motivate action across the municipality.

In terms of technical research and support to address climate change, South Africa benefits from world-class research institutions and universities. Historically, most analytical products have not been downscaled to a level useful to municipalities; however, there are increasing examples of research focused on downscaling climate information (e.g., the CSIR Green Book project) and universities partnering with municipalities to support climate analysis and response (e.g., the partnership between the University of Witwatersrand and Johannesburg). More research and partnerships like these can help make climate information useful and accessible at the local level. South Africa also benefits from strong local networks like SALGA and SACN, and

membership and robust participation in international networks like C40 and ICLEI that encourage knowledge sharing and provide training and learning opportunities to municipalities. To date, it is mostly the large metros with sufficient human and financial resources taking advantage of research and networks to implement robust climate change policies and programs. An opportunity exists to learn from these metros' experience and apply lessons learned when working with smaller, more resource-challenged municipalities.

Financing is ultimately the largest barrier when it comes to municipalities responding to climate change. Within South Africa there are multiple opportunities to support municipal access to financing. While external grant funding for climate change through international donor mechanisms like the GCF can be difficult to obtain, South Africa is well-positioned in terms of NIEs and donor support to help municipalities develop strong proposals to tap this funding. Private sector funding from domestic and international investors through mechanisms like municipal bond issuances is another underexploited opportunity. South Africa benefits from Johannesburg and Cape Town's experience with issuing green bonds. While a promising medium-term option, the financial and technical due diligence needed for a successful bond issuance require specific technical assistance, likely putting this option out of reach for many municipalities in the near term. The best near-term opportunity for municipalities is to target adaptation opportunities that address immediate needs while also providing increased longer-term resilience, streamlining adaptation actions across departments and integrating them into the budget and IDP process. For example, when doing routine replacement, the transportation department can use projections of increased heavy rainfall events to widen culverts crossing roads. Similarly, the human settlements department can use information about the impact of increased temperatures on human health to apply reflective treatment to exterior walls of houses, which reduces temperatures inside. Neither of these require complex, stand-alone adaptation projects, but rather are relatively small adjustments to existing services, rendering these services more resilient to climate change

Considered in their entirety, the dynamics of managing South Africa's diverse municipalities present well-defined challenges and opportunities. As this assessment shows, these challenges and opportunities present a strong case for supporting local governments in South Africa to respond to climate change.

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ANNEX A – SOUTH AFRICA MUNICIPALITIES MATRIX

Overview of three municipalities in South Africa, including possible entry points for donor engagement

Major climate risks/impacts	Economic base	Urban management capacity	Possible entry point for donor engagement
City of Tshwane – population 3 million (Category A)			
<ul style="list-style-type: none"> -Increased temperatures (heat stress; urban island heat effect; increased energy demands; increased risk of malaria) -Flash floods (infrastructure/house damage; risk of sinkholes) -Drying (water stress) 	<ul style="list-style-type: none"> -Economic sectors: Govt., social and personal services; finance/business; motor industry; trade/manufacturing -Urban sprawl; issues w/housing, services and infrastructure -Growing inequality (but relatively low poverty rate – 24%) -24% unemployment rate 	<p>Sustainability Unit leading climate change initiative</p> <p><u>Several strategies/plans:</u> Tshwane Vision 2055; Green Economy Strategic Framework; Vulnerability Assessment to Climate Change (2014)</p>	<p>Providing assistance to Sustainability Office to incorporate climate and related GIS information into spatial planning process focused on CCA (constraint is that this is really a capacity-building activity that might require substantial on-the-ground support)</p>
Chris Hani District Municipality – population 800,000 (Category C)			
<ul style="list-style-type: none"> – Increased temperatures – Mainly rural base, so impacts are on agriculture and water 	<ul style="list-style-type: none"> -Rural and high agricultural -Very poor (54% poverty rate) -High unemployment (57%) -High reliance on remittances 	<p>Environment and Climate Change Unit is under municipal health services department.</p> <p>Municipality has a rudimentary CCVA, but would like something more robust.</p>	<p>Assisting district environment department to structure a CCVA initiative (i.e., work with them to write a comprehensive TOR for bid out/select a service provider, help them manage the selection process and structure the contract.</p>
Buffalo City Metropolitan Municipality – population 2 million (Category A)			
<ul style="list-style-type: none"> – Flash flooding (infrastructure damage, water quality) – Increased temperatures – SLR (risks to wastewater treatments and landfill sites) 	<ul style="list-style-type: none"> –Finance, motor manufacturing, trade, growing tourism and agro-industry (has a port and airport) –Industrial Development Zone –35% poverty rate 	<p>Integrated Environment and Sustainability Unit (IEM&SD) – that houses Climate Change Unit</p> <p>–CCVA under development (currently paused)</p>	<p>Jumpstarting stalled CCVA initiative led by the disaster management department</p>

ANNEX B – SOUTH AFRICA

INTERVIEW LIST

Institution	Name	Position
National-level Institutions		
Department of Environmental Affairs/ Climate Change and Air Quality Branch	Sibonelo Mbanjwa	Director, Climate Change Adaptation–Natural Resources
	Vhalinavho Khavhagali	Director, Climate Change Adaptation
	Faith Nkohla	Deputy Director, Climate Change Adaptation
National Disaster Management Centre	Dechlan DL. Pillay	Director, Early Warning and Capability Management Systems
	Jurgens Dysssel	Director, Policy Development and Regulatory Framework
South Africa Weather Service	Jongikhaya Witi	Senior Manager, Climate Services
South African National Biodiversity Institute (SANBI)	Dr. Mandy Barnett	Director, Adaptation Fund
National Treasury/Cities Support Program	Sharon Lewis	Technical Advisor
	Anthea Stephens	Climate Resilience Component Lead
Development Bank of Southern Africa/ Green Fund	Michelle Layte	South African Green Fund Secretariat & Policy Advisory Services Manager
	Olympus Manthata	Fund Manager
	Nomsa Zondi	Climate Funds Coordinator
	Muhammed Sayed	Principal Investment Officer
South African Cities Network	Sandiswa Tshaka	Program Manager, Sustainable Cities
South African Local Government Association (SALGA)	Telly Chauke	Environmental Management and Climate Change Specialist
Donors and Implementers		
GIZ	Nadia Shah	Climate Support Programme
	Jonathan Ramayia	Climate Finance & Green Fiscal Policy and Climate Support Programme
ICLEI	Meggan Spires	Senior Manager, Climate Change, Energy & Resilience
USAID/Southern Africa	Graham Paul	Environment, Energy and Climate Change
One World/Cities Fit for Climate Change	Belinda Petrie	CEO, One World
Research Institutions		

Council for Scientific and Industrial Research (CSIR)/ The Green Book Project	Willemien Van Niekerk	Green Book Project Lead; Senior Researcher, Urban and Regional Planning
	Amy Pieterse	Green Book Project Researcher
Climate Systems Analysis Group (CSAG)	Alice McClure	
Municipal Level		
Buffalo City Metro Municipality	Rob Ferrier	General Manager, Electricity Department
	Jean Smit	Contracts Manager, Electricity Department
	Jane Galo	Environmental Impact and Systems Officer, Integrated Environmental Management and Sustainable Development
	Simpiwe Seti	Manager, IDP and Budget Integration
	Owen Becker	Manager, Disaster Management Center
City of Tshwane	Lutske Newton	Research and Stakeholder Manager, Sustainability Unit
Chris Hani District Municipality	Yoliswa Sinyanya	Director, Municipal Health Services
	Qaphela Mpotulo	Manager, Climate Change