MBOMBELA WTER REQUIREMENTS AND AVAILABILITY RECONCILIATION STRATEGY STUDY: ADAPTATION TO CLIMATE CHANGE STRATEGY

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1. Introduction

Climate change presents several challenges to municipalities, including increased frequency and duration of droughts, floods associated with intense precipitation, degraded water quality, and subsequent changes in demand for services. Global and regional climate research, conducted by international and regional research groups, has generated projections of future climate conditions based on historical climate data (i.e., temperature, precipitation, and sea level), as well as simulations based on scientific understanding of atmospheric processes (IPPC, 2001). These groups and other research institutions have translated and downscaled projections from global models to produce projections at national, regional, and local scales. In many cases, these projected changes may generate specific impacts or challenges for municipalities. In much of the world, the challenge centres on climate change adaptation, as changing climates and increased variability become the norm. Southern Africa in particular is regarded as highly vulnerable to the climate change and variability, in part due to extreme climatic changes anticipated in the region and in part due to poor institutional and financial capacity to respond to the shifting conditions.

Adaptation is focused on institutional and infrastructural responses within an uncertain future, requiring an ability to create adaptive management systems within the context of future impact scenarios. This report provides an approach to develop an adaptation plan and examples of climate change adaptation measures relevant Mbombela Municipality.

2. Adaptation strategies

Adapting a system and operations to climate change challenges requires consideration and planning. However, adaptation planning is not necessarily a new effort, distinct from other municipal practices. Because adaptation strategies can often provide multiple benefits, adaptation planning can be integrated into emergency response planning, capacity development, capital investment planning, water supply and demand planning, conservation practices, and infrastructure maintenance. Climate change adaptation strategies may provide benefits such as more sustainable and efficient operations, cost savings and maintenance of adequate water supply and quality.

The adaptation policy framework developed by the UNDP (Lim et al., 2005) is structured around four major principles, from which actions to adapt to climate change can be developed:

- adaptation to short-term climate variability and extreme events is included as a basis for reducing vulnerability to longer-term climate change;
- adaptation policies and measures are assessed in a developmental context;
- adaptation occurs at different levels of society; and
- both the strategy and the process through which adaptation is implemented are equally important.

2.1 Adaptation planning

Following United Nations Development Programme (UNDP) adaptation policy framework, adaptation strategies to climate change for Mbombela Municipal Area were proposed based on a desktop adaptation planning. Adaptation planning can be defined as an integral part of increasing municipal climate change resilience by conducting a risk assessment and adopt an associated decision-support framework (Figure 1).This framework helps to identify projected impacts and challenges associated with climate change, assessing risks of these impacts based on current thresholds of failure, selecting and implementing adaptation options and then revisiting assessments when new information is available or when additional capacity to implement options is in place. The framework includes other stressors besides climate change such as land use, population and regulatory changes. Through this framework, the municipality should be in a position to be able to adjust its adaptation strategies as it develops tools and programs to manage existing demands and continues an iterative planning process to anticipate future challenges.

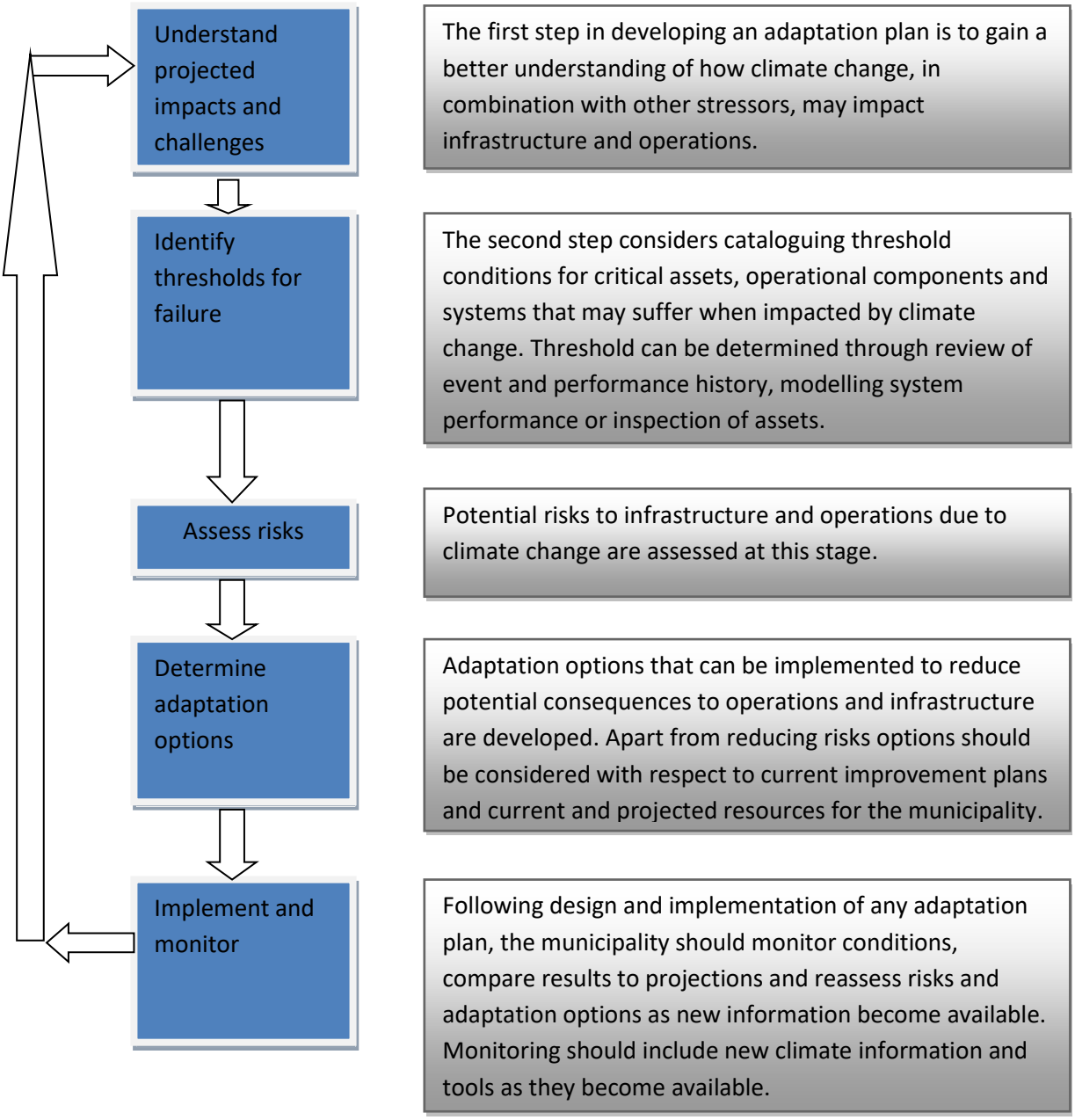

Figure 1 General process steps for adaptation planning

2.2 Potential current and future Mbombela municipal climate-induced impacts

Due to the limited nature of this study, this has been based on a desktop assessment of existing reports. Some potential actions and possible interventions have been suggested. No stakeholder consultation or assessment of the municipal capacity to plan and implement an adaptation programme has been undertaken.

2.2.1 Water Supplies

The supply of water services in the Mbombela municipal boundary faces a number of challenges, including eradicating a backlog in basic services, reducing demand, meeting wastewater effluent standards (thereby reducing impact on the water quality of Crocodile River), managing assets and ensuring that development growth demands are met.

2.2.2 Impacts and vulnerabilities

Currently, the water resources availability of the Inkomati catchment area is over-stressed and high dry spells (very low water levels) which are experienced during the dry season are attributed to climate variability. Climate variability is expected to alter the present hydrological resources in Southern Africa and to place added pressure on the adaptability of future water resources. During the past 20 years, most of Southern Africa has experienced extensive droughts, the last four being in 1986–1988, 1991–1992, 2000–2001 and 2004–2005. As shown in Figure 2, dam levels of Kwena dam were at its lowest level between 2002-2008 (<70% storage level) and thereafter dam levels were above normal. The drought-induced water shortage placed stress on water supply and management in the Crocodile River Catchment (which forms part of Mbombela Municipal Area) and resulted in the demand-side management response. The Mpumalanga Provincial Government-Department of Agriculture has already initiated a feasibility study for the construction of Mountain View dam in order to supplement Kwena Dam to meet the future irrigation demands in the catchment. Apart from water shortages, there have been cases of floods in the catchment which may be attributed to climate change. For instance, the floods in 2000 destroyed infrastructure and resulted in loss of life.

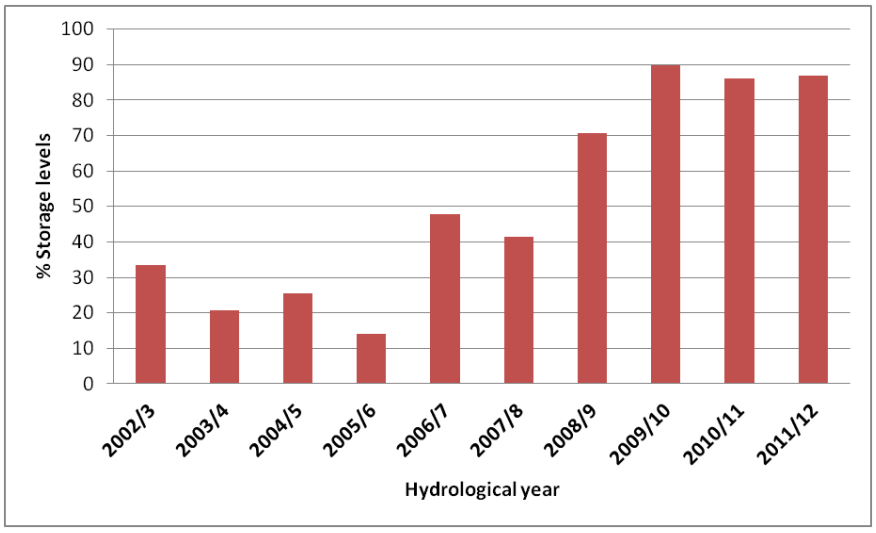

Figure 2 Minimum storage levels of Kwena Dam from 1 October 2002

2.2.3 Adaptation initiatives

As part of the main report, current water management practices such as water conservation and demand management were developed to ensure that the existing supply of water meets the growing projected demand. Some of the mechanisms may be appropriate to deal with the future intermittent shortages that will be brought about by climate variation, but robust long-term strategies are required to ensure that water demand matches supply, even in times of reduced availability. In addressing future projected climate change impacts, some of the proposed measures may need to be introduced sooner than originally planned.

The other sections of the main report has also recognised the need for an integrated water resource planning approach to manage the changing water demand as well as address the effects of population, economic growth and stress on the water supply. The stresses on water supply should include projected climate impacts. In addition, there should be a strong focus on defence of the ecological reserve to ensure sustainability of river ecosystems. The Inkomati Management Agency (ICMA) should encourage that no development or investment decisions should be made within the catchment without taking into account actual or potential effects of climate change on water resources. In addition, it is important that the impacts due to the changes in climate be monitored as a precautionary measure. Special attention should be given to long-term monitoring of hydrometeorological parameters. Water planners and managers need to use the available climate data to make strategic decisions on an ongoing basis.

2.3 Adaptation options

The adaptation options to address climate change related impacts for the Mbombela Municipal boundary are presented and categorised into Planning strategies, Operational Strategies and Capital/Infrastructure strategies. This report only presents generic strategies to adapt to climate change and specific strategies will only be developed when a full assessment is done which include stakeholder consultations on preferred options. The municipality and other institutions involved in water resources management should adopt the following:

2.3.1 Planning strategies

- Integrate flood management and modeling into land use planning.
- Develop emergency response plans to deal with the relevant natural disasters (e.g. flooding) and include stakeholder engagement and communication.

- Develop models to understand potential water quality changes and costs of resultant changes in treatment.
- Conduct climate change impacts and adaptation training for personnel.
- Participate in community planning and regional collaborations related to climate change adaptation.

2.3.2 Operational strategies

- Continue to monitor current weather conditions.
- Continue to monitor surface water conditions, including streamflow and water quality.
- Investigate on options to recycle water.
- Monitor and inspect integrity of existing infrastructure.
- Practice water conservation and demand management through water metering, rebates for water conserving appliances/toilets and/or rainwater harvesting tanks.

2.3.3 Capital/Infrastructure strategies

- Build or expand infrastructure to support conjunctive use.
- Expand current resources by developing regional water connections to allow for water trading in times of service disruption or shortage.
- Increase water storage capacity, by upgrading existing or construction of new reservoirs and/or dams.
- Increase capacity for wastewater and stormwater collection, treatment and discharge, including redundancies to hedge against infrastructure losses and disruptions.
- Increase treatment capabilities and capacities to address more stringent treatment requirements.

It is clear municipalities should be vigilant and adapt to both supply-side and demand management measures to curb climate change impacts.

3. Conclusion

This report presents an approach for Mbombela municipality to develop an integrated adaptation plan. This plan should be used initially to educate planners concerning the potential impacts and to develop both sectorally based and cross-sectoral interventions. With time, the integration of climate-sensitive actions into development planning should become common in its strategic plans. An integral part of the adaptation plan is the inclusion of an early warning system, where daily and seasonal weather forecasts are monitored to identify any impacts and

potential disasters. A communication protocol is required to ensure that early warnings from the relevant entities are effectively communicated to the affected authority and communities so that appropriate interventions can be initiated.

A number of potential barriers to implementing an adaptation plan do, however, exist. Issues such as low local human capacity to undertake this kind of planning, and the limited knowledge and understanding of climate issues at local and municipal level are some of the more obvious obstacles. Limited financial resources and competing priorities often result in medium- to long- term planning being sidelined, and projects that do not fit into the short political life of decision makers are not implemented. It is difficult to convince decision makers to consider the need for a climate strategy when the climate projections cover a longer time horizon than the political and development framework and are associated with high uncertainty. Finally, in the absence of a legislative framework, the municipality may not undertake comprehensive and consistent adaptation planning.

This report is an initial, broad overview of the problems posed by projected climate change, and requires further attention to detail in many areas before a clear adaptive strategy can be developed. Further focused study is required, both to reduce uncertainties in many areas relating to the climate projections themselves and to improve understanding of the implications of impacts and sectoral and cross-sectoral vulnerabilities. More detailed assessments of the vulnerability of key threatened areas, together with likely timelines of impacts, should be undertaken. Along with this is the need to better understand how institutions might “adapt”, to enable climate sensitive development to become the norm, not only in order to respond to projected climate impacts but also to ensure resilience to current climate variability.

4. References

Lim, B, E Spanger-Siegfried, I Burton, E Malone and S Huq (2005), Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures, Cambridge University Press, UNDP.

IPCC (2001) Climate Change 2001: Impacts, Adaptation and Vulnerability. Intergovernmental Panel on Climate Change, Working Group II Contribution to the Third Assessment Report of IPCC. Geneva, Switzerland.