

EDEN DISTRICT MUNICIPALITY WETLAND REPORT | 2017

LOCAL ACTION FOR BIODIVERSITY (LAB): WETLANDS SOUTH AFRICA



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Wetlands are one of the most valuable and diverse ecosystems on this planet and are essential for human existence. Wetlands clean the water we drink as well as provide nutritious food in the form of plants and fish. Wetlands also provide organic materials which can be used for medicinal purposes. They help protect us from flooding and storm surges and also have the ability to store water which is then released in times of drought. Wetlands also provide key habitat for a significant array of critically endangered flora and fauna.

Wetlands also play a key role in the mitigation of climate change, which is predicted to have a major impact on human livelihoods. They can store large amounts of carbon and thus can help with the regulation of greenhouse gases thereby assisting in the control of accelerating climate change. These ecosystems also have the ability to protect against the effects of climate change by reducing flooding risk, stabilising shorelines and controlling erosion.

Despite the essential role wetlands play in maintaining the delicate balance of life on Earth, they are being lost and degraded at an unprecedented rate, faster than any other ecosystem in the world. Since the 1900s, it is estimated that 64% of the world's wetlands have been destroyed. Within South Africa, 50% of the country's wetlands have been lost and 48% of the remaining wetlands are critically endangered. The astounding loss of the wetland systems worldwide is largely as a result of wetland areas being 'reclaimed' for expanding urban development or agricultural expansion as well as encroachment of invasive alien vegetation. As a result, species which once populated these areas in vast numbers are seeing a

rapid decline and countless animals and plants have been brought to the verge of extinction. Wetlands are also increasingly unable to perform the ecosystem services so vital for human life.

In the 21st century we need wetlands more than ever before. The conservation and the management of wetlands in a holistic, collaborative and effective manner is therefore essential to sustain human livelihoods and local economies, protect our valuable biodiversity and buffer the impacts of climate change.

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ICLEI – Local Governments for Sustainability is the leading global network of over 1,500 cities, towns and regions committed to building a sustainable future. By helping the ICLEI Network to become sustainable, low-carbon, ecomobile, resilient, biodiverse, resource-efficient, healthy and happy, with a green economy and smart infrastructure, we impact over 25% of the global urban population.

ICLEI Africa’s work is conducted by a dynamic and passionate team of professionals that seek to work with cities to ensure a more sustainable future, with a specific focus on urban biodiversity matters.

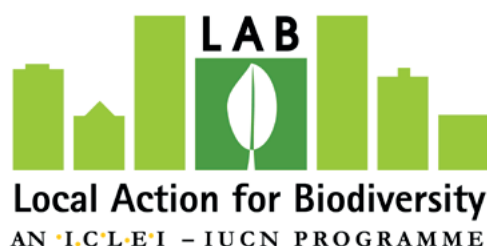
In order to strengthen the role cities and local governments play in the pursuit of greater sustainability through the collaborative design and implementation of integrated urban development and effective biodiversity management, the ICLEI Cities Biodiversity Center (ICLEI CBC) was created in 2009. The ICLEI CBC is located in Cape Town, South Africa, embedded in the Africa Regional Office of ICLEI. We offer cities a broad portfolio of supportive services through our dedicated team of passionate, skilled and dynamic biodiversity and urban development experts.



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LOCAL ACTION FOR BIODIVERSITY PROGRAMME

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The ICLEI Cities Biodiversity Center aims to create BiodiverCities, which promote urban biodiversity for the many benefits they offer, including human well-being, poverty alleviation, habitat conservation, air and water quality, climate change adaptation and mitigation, food provision, fortified infrastructure resilience, and happiness of citizens.

BiodiverCities are aware that ecosystem services contribute towards many essential municipal services, as well as towards the local economy, sustainability and social well-being of their cities. Biodiversity in cities provides a critical contribution towards achieving the global biodiversity targets.

It buffers further biodiversity loss, improves the urban standard of living, and provides local opportunities for global education and awareness.

ICLEI's Local Action for Biodiversity (LAB) programme is a unique global biodiversity programme run by The ICLEI Cities Biodiversity Center. The LAB Program is aimed at improving and enhancing ecosystem management at the local level, and is recognized globally as the leading results-driven local government biodiversity initiative. Currently, LAB is working on wetland restoration in South Africa under the Local Action for Biodiversity: Wetlands South Africa (LAB Wetlands SA) project.



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LIST OF ACRONYMS AND ABBREVIATIONS

AS	Africa Secretariat	SPLUMA	Spatial Planning and Land Use Management Act
BGCMA	Breede-Gouritz Catchment Management Agency	SWSA	Strategic Water Source Area
BGIS	Biodiversity Geographic Information System	UCT	University of Cape Town
CARA	Conservation Agricultural Resources Act	UNFCCC	United Nations Framework Convention on Climate Change
CBA	Critical Biodiversity Area	WCDM	Western Cape Disaster Management
CEPA	Communication, Education and Public Awareness	WFW	Working for Wetlands
CIP	Climate Information Portal	WSA	Water Source Area
CMA	Catchment Management Area		
CSAG	Climate Systems Analysis Group		
DEA	Department of Environmental Affairs		
DEA&DP	Department of Environmental Affairs and Development Planning		
DRA	Disaster Risk Assessment		
DRM	Disaster Risk Management		
DRMP	Disaster Risk Management Plan		
EDM	Eden District Municipality		
EIA	Environmental Impact Assessment		
EMF	Environmental Management Framework		
GIS	Geographic Information System		
IAP	Invasive Alien Plant		
ICLEI	ICLEI – Local Governments for Sustainability		
IDP	Integrated Development Plan		
LAB	Local Action for Biodiversity		
LM	Local Municipality		
NEMA	National Environmental Management Act		
NEMBA	National Environmental Management: Biodiversity Act		
NEMWA	National Environmental Management: Water Act		
NFEPA	National Freshwater Ecosystem Priority Areas		
NGO	Non-Governmental Organisation		
NVT	Nature’s Valley Trust		
NWA	National Water Act		
SA	South Africa		
SANBI	South African National Biodiversity Institute		
SANParks	South Africa National Parks		
SAWS	South African Weather Service		
SCWF	Southern Cape Wetland Forum		
SDF	Spatial Development Framework		

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EXECUTIVE SUMMARY

Eden District Municipality is located in the Western Cape Province of South Africa and covers an area of 23 331 km². The municipality falls within the Cape Floristic Region (a recognised World Heritage Site and a global biodiversity hotspot with high levels of endemism and diversity for plants and animals). Numerous wetlands can be found throughout the municipality, including one RAMSAR site of international importance, which provide crucial habitat for the unique flora in the region as well as for a variety of critically endangered flora and fauna species.

The wetlands throughout Eden District Municipality are considered to be high-value 'ecological infrastructure' as they not only provide habitat for flora and fauna, but also provide critical ecosystem services to the municipality. These include flood attenuation, water filtration, erosion control and water storage (regulatory services) as well as food provision, supply of raw materials and clean drinking water (provisioning services). The wetlands within the municipality also play a pivotal role in disaster risk management as well as reducing the impacts of climate change within the district.

Despite the wetlands within Eden District Municipality being of high value to the municipality in terms of ecosystem service provision, a large number of the wetlands in the region are under threat or have already been lost. This is largely due to historical degradation, deliberate draining of wetlands to make way for development and agriculture, inappropriate development within the close proximity to the wetlands, poorly regulated agricultural practices, contamination through chemical, sewage, effluent and stormwater seeps, sedimentation, water abstraction and the spread of invasive alien plants (IAPs) (particularly Blue Gum, Black Wattle and Rooikrans). Degraded wetlands are unable to function to the same degree as healthy wetlands and as such ecosystem service provision is severely hindered or even lost altogether. As such, careful management as well as the investment in the maintenance of healthy wetlands and the rehabilitation and restoration of degraded wetlands is required. This will ensure the continued provision of these vital ecosystem services to the municipality.

Currently there is no specific designated wetland management authority within Eden District Municipality. Instead, the management of wetlands is a collective but disconnected effort between the various departments of Eden District Municipality, the six local municipalities within Eden District Municipality, parastatals such as CapeNature and SANParks and private stakeholders, each of which have their own key objectives and management requirements. Various forums also inform wetland management and include the Southern Cape Wetlands Forum (SCWF), which is required to provide input towards prioritising wetlands for funding and rehabilitation, as well as the Plett Environmental Forum, the SANParks Forum, the Fynbos Forum, Knysna Catchment Management Forum and the Wilderness Lakes Catchment Management Forum.

In order to streamline and improve the management of wetlands, Eden District Municipality is implementing the Local Action for Biodiversity: Wetlands South Africa (LAB: Wetlands SA) programme with support from ICLEI Africa Secretariat (ICLEI AS). The LAB: Wetlands SA project aims to ensure the protection of priority natural wetland resources, thus enabling the continued supply of ecosystem services, and promoting resilient communities and sustainable local economies under a changing climate within the South African local government context. Through the development of this Wetland Report, ICLEI AS will assist Eden District Municipality in identifying the gaps in management and assist with devising new and better wetland management strategies going forward.

INTRODUCTION

South Africa is endowed with a rich wealth of biodiversity, which offers an immense opportunity to support the country's development path by providing many goods and services which contribute to municipal service delivery, water and food security and quality of life, especially under a changing climate. Wetlands in particular, are high-value 'ecological infrastructure', providing critical ecosystem services such as clean water, clean air, food, medicines, water storage and habitat for biodiversity. Wetlands also play a role in disaster management, and could lessen the negative effects of climate change through flood attenuation, temperature regulation as well as water and food security.

Wetlands however are South Africa's most threatened ecosystems, with 48% of wetland ecosystems critically endangered¹, resulting in an urgent need to increase awareness of wetland importance and to incorporate natural wetland resource considerations into municipal governance mechanisms and planning.

Eden District Municipality (EDM) is located in the Western Cape Province of South Africa (Figure 1). Numerous wetlands, including one RAMSAR site of high ecological value and exceptional beauty, occur within the region and provide crucial habitat for a variety of critically endangered flora and fauna species as well as provide key ecosystem services for local communities living in the area. A large number of the wetlands in the region however are under threat due to historical unsustainable development and agricultural practices (both cultivation and livestock farming) as well as encroachment of invasive alien plants (IAPs).

This report draws together the range of knowledge about wetlands within Eden District Municipality, and provides a detailed overview of the stakeholders and programmes working towards improved wetland management in this region.

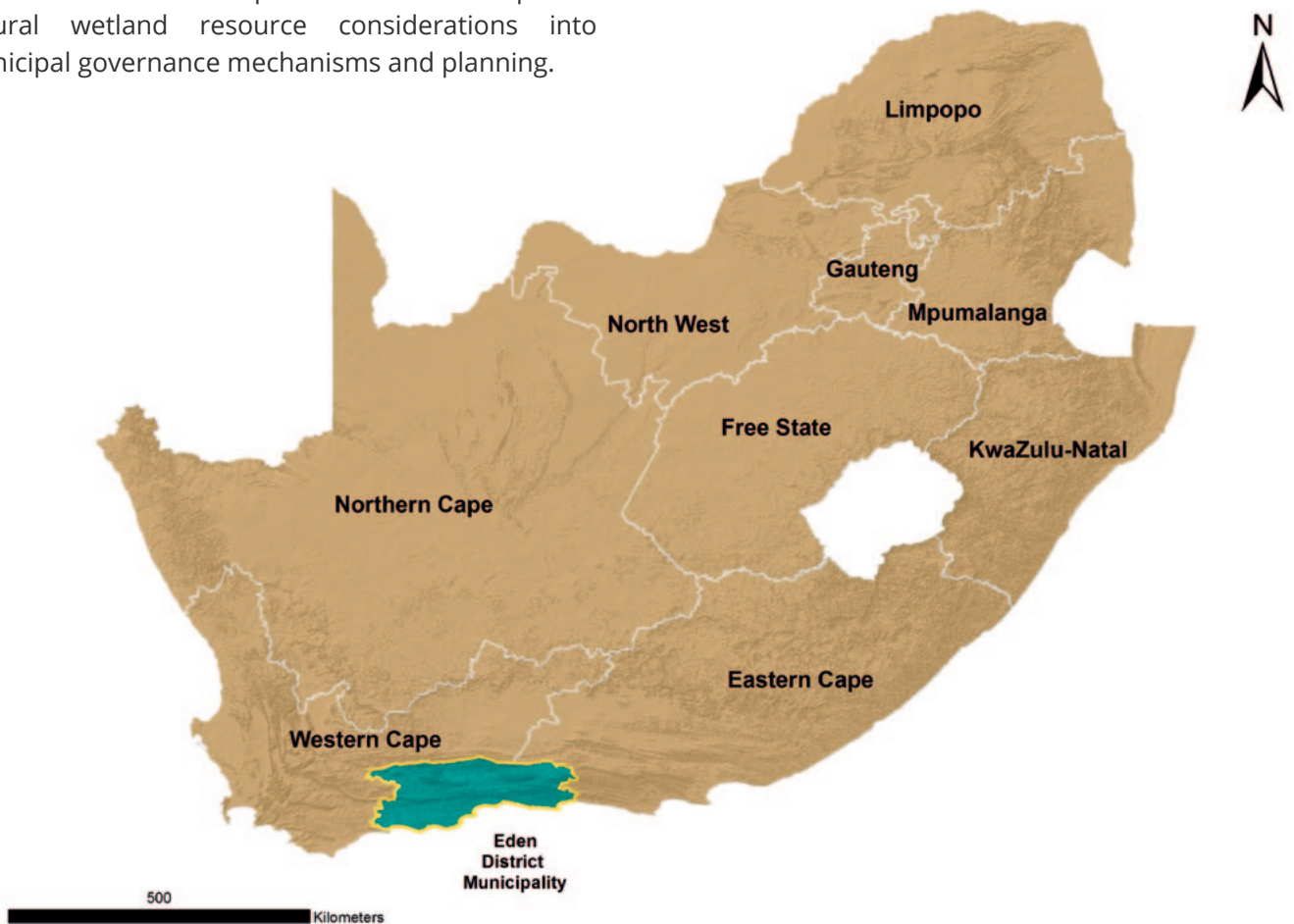


FIGURE 1: Eden District Municipality in relation to the rest of South Africa.

1 | WHAT IS A WETLAND?

“Wetlands are land which is transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.”

National Water Act No. 36 of 1998

In simpler terms, a wetland is a feature in the landscape which is saturated with water for a long enough period that the soil conditions change (mottling as a result of the anaerobic conditions) and the vegetation shifts to respond to these changes.²

Six different types of wetlands occur across the country. These vary based on the underlying geology and include seeps, depressions, wetland flats, floodplain wetlands, channelled valley-bottom wetlands and unchannelled valley bottom wetlands.⁴ SANBI has compiled a detailed hydro-geomorphic classification system to assist with wetland identification. An illustrative overview from this guide on the different types of wetlands is included in **Figure 4**.

Wetlands also vary on a temporal scale based on the climate and season. As such, once a wetland type has been established, it can then be categorised into either a temporary, seasonal or permanent wetland. A temporary wetland is saturated for a very short period (approximately one month) during the rainy season only. Vegetation types associated with this type of wetland are predominantly grass species, as well as a mixture of species that occur in non-wetland areas and hydrophytic plants that are largely restricted to wetland areas. A seasonal wetland is saturated for most of the growing season. Vegetation types associated with this type of wetland are predominantly sedges and grasses that are restricted to wetland areas, usually < 1m tall. Lastly, a permanent wetland is saturated all year round. This type of wetland is dominated by highly specialised aquatic plants adapted to permanently wet conditions.² For further detail regarding specific wetlands located within Eden District Municipality, please refer to **Section 3.2** of this report.



FIGURE 2 & 3: Mottled soils indicative of a wetland (top) and specially adapted wetland vegetation (bottom).³

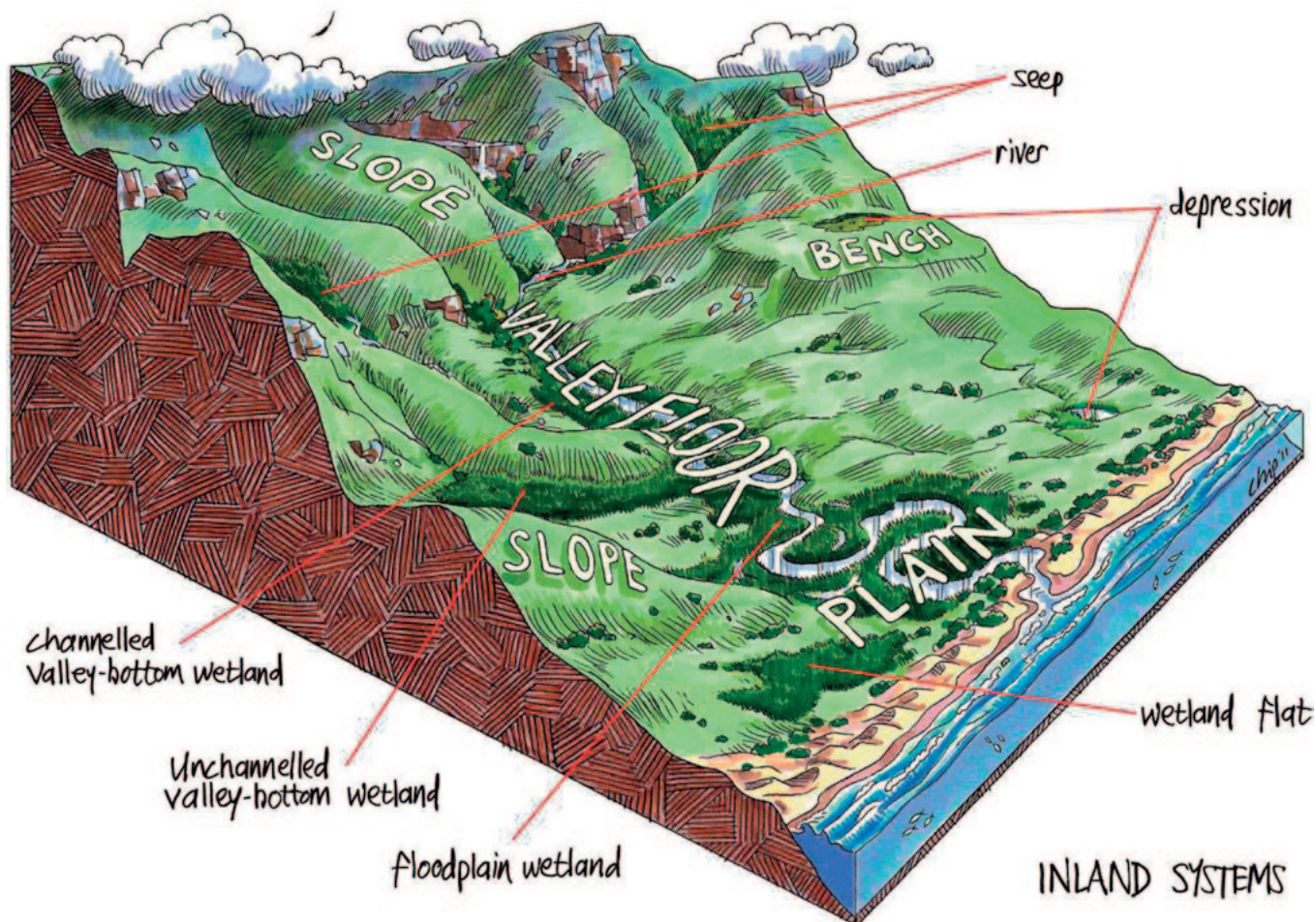


FIGURE 4: Wetland systems within South Africa.⁴

All wetland types can be classified as high value 'ecological infrastructure' due to the large number of ecosystem services that they provide. Wetland ecosystem services can be classified into four separate categories namely 'provisioning services', 'regulating services', 'cultural services' and 'supporting services'.⁵ Provisioning services can be described as the products one can physically obtain from wetlands such as fresh water, food and natural medicines. Regulatory services can be described as the benefits one receives from the wetland such as stream flow regulation, erosion control, water filtration and flood attenuation.⁵ Cultural services are the nonmaterial benefits that one can obtain from wetlands such as spiritual enrichment, sense of place and aesthetic experience.⁵ Lastly, supporting services are the services provided that are necessary for the

production of all other ecosystem services namely, nutrient cycling and water cycling.⁵ Please refer to **Section 3.6** of this report for a detailed description of the identified ecosystem services that wetlands within Eden District Municipality provide.

It should be noted that ecosystem services provided by wetlands come at no cost to local authorities and as such, all that needs to be done to ensure continued provision of these services is to protect and maintain local wetlands. However, the inappropriate management of wetlands, can cause a loss of wetland area and subsequent loss of ecosystem services. This results in municipalities having to invest in expensive infrastructure (e.g. water filtration plants or flood barriers) to ensure the same level of service delivery.

2 | WHAT IS BIODIVERSITY?

‘ The variability among living organisms from all sources, including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems. ’

National Environmental Management: Biodiversity Act No. 10 of 2004

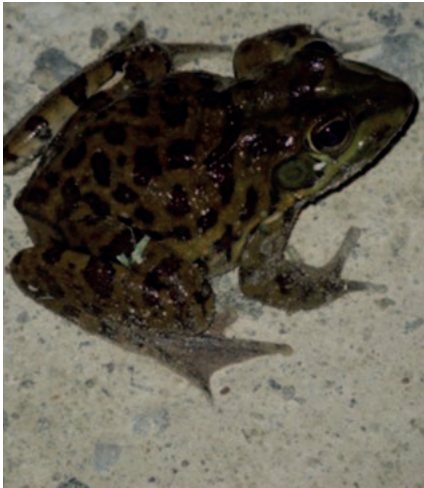


FIGURE 5, 6 AND 7: Cape River Frog (*Amietia fuscigula*) (left), the Arum Lily Frog (*Hyperolius horstockii*) (centre) and the Raucous Toad (*Amietophrynus rangeri*) (right), three key amphibia species endemic to the Western Cape area.⁶

To expand on this, biological diversity or the shorter more commonly used term ‘biodiversity’, is the variety of genes, species and ecosystems on Earth, and the processes that maintain this diversity. It is the living species and natural processes that constitute nature. Rather than simply considering plant and animal populations (i.e. total numbers), biodiversity reflects the variability of plants and animals and crucially, the processes by which they are supported, and the functions that they deliver.

Essentially, as biodiversity includes natural processes, it describes the health and functioning of a given area. For example, if a wetland becomes polluted and its ecological condition deteriorates, it is no longer able to function correctly and natural processes such as providing food (e.g. fish), materials (e.g. reeds) and water purification no longer take place. The real value in the term biodiversity is that by describing the variety of life forms rather than total numbers, biodiversity can be used at any scale (e.g. for landscapes such as grasslands or a habitat such as a woodland or koppie) to reflect the health of any area – not just wild landscapes, but pockets of biodiversity such as wetlands, too.

3 | WETLANDS AND BIODIVERSITY IN THE EDEN DISTRICT MUNICIPALITY

Eden District Municipality is located in the south-east of the Western Cape Province of South Africa. It covers an area of 23 331 km² and is bordered by Overberg District Municipality to the west, Cape Winelands District (Boland District) to the north-west, Central Karoo District to the north and Sarah Baartman/ Cacadu District Municipality to the east (i.e. the Eastern Cape Provincial boundary). Within Eden District Municipality are seven local municipalities namely Hessequa Local Municipality, Kannaland Local Municipality, Oudtshoorn Local Municipality, Mossel Bay Local Municipality, George Local Municipality, Knysna Local Municipality and Bitou Local Municipality (refer to **Figure 8**).

Eden District Municipality falls within the Cape Floristic Region, (a recognised World Heritage site and global biodiversity hotspot with high levels of endemism and diversity for plants and animals). Numerous wetlands, including one RAMSAR site of high ecological value and exceptional beauty, occur

throughout the municipality and provide crucial habitat for the unique flora in the region as well as for a variety of critically endangered flora and fauna species. The wetlands also provide key ecosystem services to the municipality. In light of this, the Garden Route Biosphere Reserve has described the wetlands located within Eden District Municipality as being *“the most valuable ecological resources within the entire catchment area”*.⁷

This section will provide existing maps, information on the known key wetlands in the district as well information on some of the key flora and fauna species found in the district. It will provide detail on the value of wetlands to the district and highlight the key threats to wetlands. Also included is the known information on how wetlands in the southern Cape region have been altered over time as a result of external factors, and the role of Eden District Municipality as a Strategic Water Source Area.

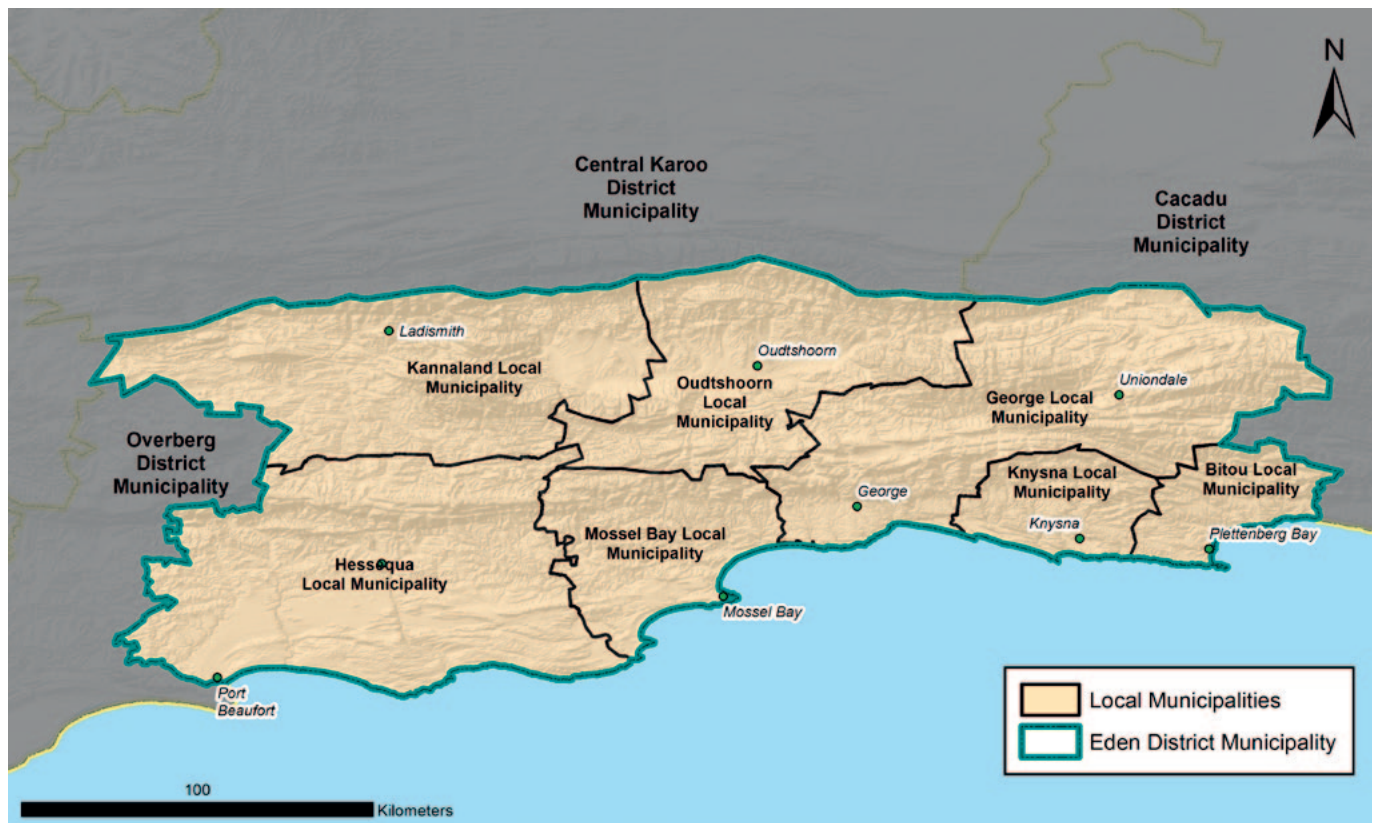


FIGURE 8: Local Municipalities located within Eden District Municipality.

3.1 MAPPING WETLANDS IN EDEN DISTRICT MUNICIPALITY

Currently there is no specific ground-truthed/verified wetland map available which covers the Eden District Municipality in its entirety. At the local municipal level, out of the seven local municipalities located within Eden, only Bitou Local Municipality has spatial planning maps included in their local Spatial Development Framework (SDF) that incorporates basic wetland data.⁸ These maps however do not use ground-truthed or verified data and as such can only be used for initial planning within the local municipality. In addition, only one wetland within the Bitou Local Municipality had been mapped using ground-truthed data, namely the Bitou Valley Wetland located near Plettenburg Bay. Please refer to **Annex 1** for the Bitou Local Municipality Spatial Planning Maps which include wetland overlays and **Annex 2** for the ground-truthed maps of the Bitou Wetland.

SANBI's National Freshwater Ecosystem Priority Area (NFEPA) provides a broad national-level overview of where wetlands are located within the landscape including individual wetlands and clusters of wetlands which are considered to be of regional or national importance. As such, the SANBI NFEPA data can be used as a first-level or preliminary assessment of wetland occurrence within the municipality (refer to **Figure 9** for Eden District Municipality, and **Annex 3** for the local municipalities within Eden District Municipality).

It should be noted however, that the NFEPA wetland map is based predominantly on remote-sensing imagery (which does not always detect features on the ground) and at this stage is largely not ground-truthed. As such the data should be treated with caution and for initial planning only as some wetlands may not be reflected (e.g. a number of known seeps occurring within the municipality are not reflected in the NFEPA wetland map whilst a number of farm dams are). Despite these limitations, the NFEPA wetland map is thought to provide the best available indication of true wetland distribution data across the country and although the spatial representation of wetlands cannot be considered as definitive, it does provide an indication of relative wetland occurrence, size and density across the municipality.

In addition to the SANBI BGIS Mapping tool, the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) has developed the CapeFarmMapper Tool (<http://gis.elsenburg.com/apps/cfm/>). The CapeFarmMapper is used primarily to indicate the details of a given property within the Western Cape Province (e.g. farm/property name, cadastral number etc.). The tool however, among other additional datasets, also has the SANBI NFEPA wetland map data incorporated into it and as such can be used as an alternative means of accessing



FIGURE 9: Map indicating the spatial distribution of the NFEPA wetlands within Eden District Municipality.

3.1 MAPPING WETLANDS IN EDEN DISTRICT MUNICIPALITY *(continued)*

NFEPA wetland data. As noted above, the wetland information is based on remote sensing imagery and not all ground truthed and as such this tool can also only be used for initial mapping and planning only.

Based on the information available at the time of writing this report, it is clear that there are significant gaps in wetland mapping across the district and that there is a real need for comprehensive ground-truthed

mapping to be undertaken within the municipality to assist with accurate and holistic planning going forward, both at a local level as well as at a district level. This could be achieved by incorporating a GIS specialist into the existing municipal structure to undertake the required mapping or by employing a wetland specialist to ground-truth wetlands within Eden District Municipality and developing a wetland map accordingly.

3.2 KEY WETLANDS IN THE EDEN DISTRICT MUNICIPALITY

Numerous wetlands considered to be high-value 'ecological infrastructure' can be found throughout Eden District Municipality. These include one RAMSAR site of international importance, which provides crucial habitat and breeding ground for resident and international migrant birds, as well as a variety of other wetland systems which not only provide critical habitat for flora and fauna, but also provide essential ecosystem services to the municipality.

This section, will go into detail on some of the identified key wetlands within the district. The case studies outlined below are not exhaustive however, as a significant number of other wetlands of "high ecological value" occur throughout the district.

3.2.1 Wilderness Lakes System (RAMSAR site)

The Wilderness Lakes System is comprised of a set of three permanent, interconnected coastal lakes of exceptional beauty that were awarded RAMSAR status in 1991.⁹ The Lakes are approximately 1 300 ha in size and are located within the Garden Route National Park, Wilderness Section, which lies along the southern coast of Eden District Municipality. George is located 14 km to the west and Knysna is 30 km to the east of the Wilderness Lakes System.⁹

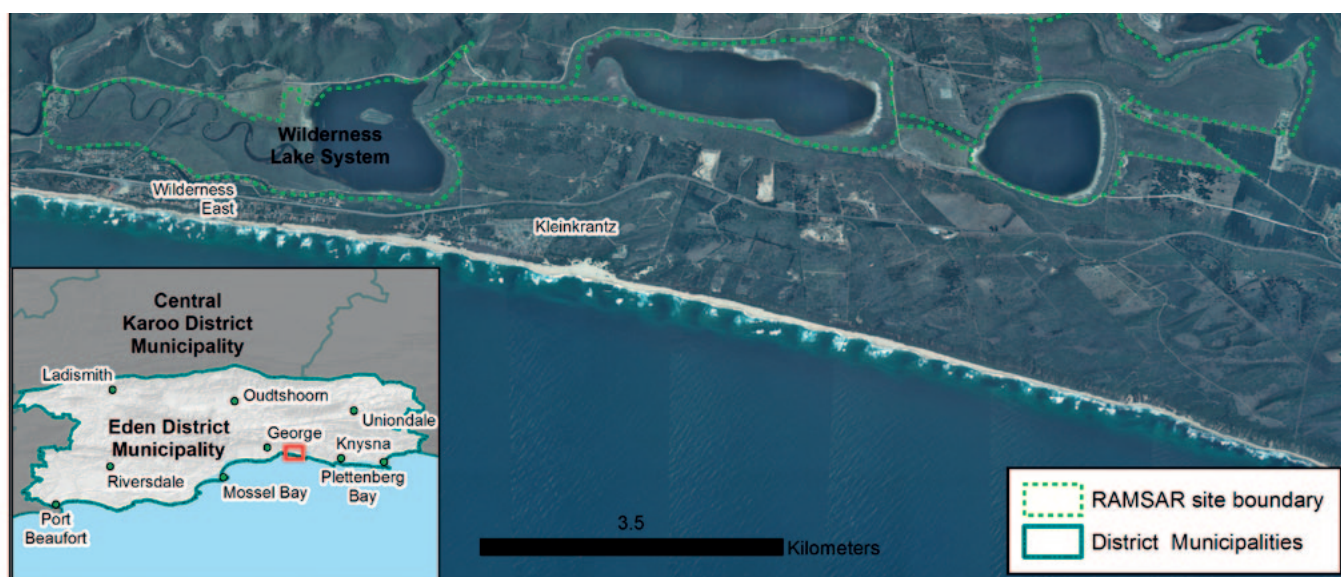


FIGURE 10: Map of the Wilderness Lakes system located within Wilderness on the southern coast of Eden District Municipality.

3.2 KEY WETLANDS IN THE EDEN DISTRICT MUNICIPALITY *(continued)*

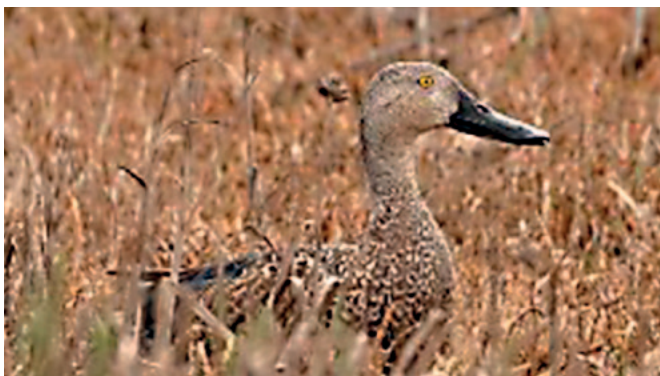
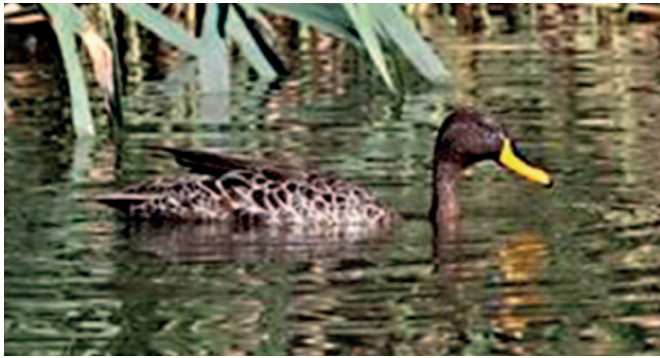


FIGURE 11, 12, 13 & 14: From top to bottom – Yellow-billed Duck¹⁰, Cape Shoveller¹¹, Little Bittern¹² and Caspia Tern¹³

The wetland system is considered to be of international importance as it provides ideal habitat for numerous species of water birds, particularly during the summer months when inland water sources dry up or deteriorate. To date, 119 different species of water birds relying entirely on permanently or temporarily inundated or semi-inundated (wetland) areas have been recorded at the site.⁹ Significant water bird species include the Black-necked Grebe (*Podiceps nigricollis*), the Reed Cormorant (*Phalacrocorax africanus*), the Yellowbilled Duck (*Anas undulata*) and the Cape Shoveller Duck (*Anas smithii*). The resident population of Yellowbilled Duck and Cape Shoveller Duck represent 5% and 3% respectively of the total South Africa population.⁹

Of the water birds recorded at the site, two species are classified as rare. The first is the resident non-migrating Little Bittern (*Ixobrychus minutus payesii*) which has less than 100 breeding pairs in South Africa. The second is the Caspian Tern (*Hydroprogne caspia*) which is an irregular non-breeding visitor with less than five appearing together at any one time. There are thought to be only 150 breeding pairs of this species in South Africa.⁹ There is also evidence to suggest that the lakes are used by several bird species as a stopover point on their moult migration. Recorded species include the Spurwinged Goose (*Plectropterus gambensis*), Egyptian Goose (*Alopochen aegypticus*) and the Southern Pochard (*Netta erythroptalma*).⁹

The Wilderness Lakes system is not just important from a birding perspective. The system also provides vital habitat for 320 different plant species as well as habitat and spawning waters for various fish species including the Spotted Grunter (*Pomadasys commersonnii*), Cape Stumpnose (*Rhabdosargus holubi*) and the Knysna Halfbeak (*Hyporhamphus capensis*), who all use the lakes as a nursery area. These species enter the estuary as juveniles and migrate up inter-connecting channels to the lakes where they mature, before migrating back to sea again to spawn.⁹

3.2 KEY WETLANDS IN THE EDEN DISTRICT MUNICIPALITY *(continued)*

3.2.2 Bitou Valley Wetland

The Bitou Valley wetland is 23 km long and approximately 645 ha in size. It is located within the Bitou Valley just east of the coastal town of Plettenberg Bay. The wetland forms part of the Keurbooms River and greater wetland system which feeds into the Keurbooms Estuary. The Keurbooms Estuary is ranked as the 18th most important system in South Africa in terms of conservation importance.¹⁴

Whilst the wetland does not have RAMSAR status, it is considered to be *“the most valuable ecological resource of the entire catchment”*.¹⁴ Historically the wetland

has provided key habitat and foraging ground for a number of important bird species including the Rare Greater Flamingo (*Phoenicopterus ruber*), the Lesser Flamingo (*Phoeniconaias minor*), Spur Wing Goose (*Plectropterus gambensis*), Moorhen (*Gallinula chloropus*) and the Yellowbilled Duck (*Anas undulata*).¹⁴ A range of interesting vegetation including various salt marsh species, reeds, grasses as well as fynbos species (including the Tsitsikamma Plateau Fynbos, Keurboom-Tsitsikamma Plateau Fynbos and Knysna Affromontane Forest) have also historically occurred in the area.¹⁴



FIGURE 15: The Keurbooms River (centre) and Bitou wetland system (top right) joining to feed the Keurbooms Estuary.¹⁴

3.2 KEY WETLANDS IN THE EDEN DISTRICT MUNICIPALITY *(continued)*



FIGURE 16 AND 17: Greater Flamingo (left)¹⁵ and Moorhen (right).¹⁶

In recent years however, encroaching residential development on the periphery of the wetland, commercial forestry, siltation and reed encroachment as well as encroachment of IAPs and seepage of effluent, pesticide and fertilizers into the wetland is degrading and damaging the wetland and in the process pushing out the indigenous vegetation and compromising the crucial habitat used for foraging and breeding for the many bird species utilising the area.¹⁴ As such, the local bird population in and around Bitou Wetland has declined drastically. Both Greater and Lesser Flamingos have not been seen in the wetland area for over 14 years whilst recorded sightings of Spur Wing Geese, Moorhens and Dabchicks have decreased to the point where these species are either not seen or their numbers have been much reduced.¹⁴

The wetland also provides vital breeding and nursery grounds for a number of invertebrate species including the Endangered Knysna Sea Horse or Cape Sea Horse (*Hippocampus capensis*), as well as a variety of fish species including the Endangered Slender Redfin (*Pseudobarbus tenuis*), Groovy Mullet (*Liza dumerili*) and White Steenbras (*Lithognathus lithognathus*), all of which contribute to the local economy and local livelihoods as a food source.¹⁴ The local fish species utilising the wetland have not exhibited a decline in numbers as yet, however in order to ensure that the habitat remains viable for the variety of fish species inhabiting the wetland and is returned to a state where bird species may thrive once again, the wetland is in critical need of conservation and protection.¹⁴

3.2.3 Knysna Estuary

The Knysna Estuary, although not strictly a wetland system, is included here as it is considered to be the most important estuary in South Africa (in terms of size, habitat, zonal type rarity and biodiversity).¹⁷ The Knysna Estuary is located at the base of the Knysna River and is approximately 20 km² in size, making it the largest estuarine system along the southern coast of South Africa. It is located directly south of the town of Knysna, 62 km east of George and 32 km west of Plettenberg Bay.¹⁷

The Knysna Estuary is well-known for its extensive biodiversity and subsequently it is currently under the management jurisdiction of South African National Parks (SANParks). The estuary provides a critical nursery area and feeding ground for over 100 marine fish, prawn and crab species and additionally provides conduits for a variety of species which move between ocean and rivers (particularly eel and certain invertebrate species). The Knysna Estuary also supports a number of endemic species such as the Knysna Sea Horse (*Hippocampus capensis*) and the Endangered Limpet (*Siphonaria compressa*) which depends on the estuary for its survival.¹⁸

In addition to the critical role the Knysna Estuary plays in supporting marine life, the estuary also provides vital feeding, staging sites and breeding grounds for significant populations of migratory birds. This includes a relatively large breeding population of African Black Oyster Catchers (*Haematopus bachmani*) which are currently listed as threatened.¹⁸

3.3 KEY FLORA AND FAUNA OF THE EDEN DISTRICT MUNICIPALITY WETLANDS

3.3.1 Flora

As noted above, Eden District Municipality is located within the Cape Floristic Region (a recognised World Heritage Site and a global biodiversity hotspot with high levels of endemism and diversity for plants and animals). From a wetland perspective, Palmiet (*Prionium serratum*) is considered to be a wetland plant of particular significance. Palmiet dominated wetlands are found throughout the district in marshy areas, streams and riverbanks, however are most predominantly found between the mountain and coastline areas towards the southern portion of the district. This plant is of particular significance due to its organic engineering-like nature. Not only does the plant have the ability to stabilise river and stream banks, thereby holding the ecosystem in place and preventing erosion in the face of flooding¹⁹, but also has the ability to slow the velocity and attenuate flood waters as well as filter water and store water in times of drought.²⁰ As such Palmiet plays a key role in disaster risk management in the district. The robust leaves can also be used for food as well as for basketry work and mats and as such the plant also plays a role in supporting local livelihoods.²¹

Despite the vital role that Palmiet plays in maintaining the riparian ecosystem and sustaining human well-being, 60% of these wetland systems have been destroyed¹⁹ and clearing, drainage and degradation is widespread.¹⁹ The plant is also highly threatened by the encroachment of IAPs (particularly Black Wattle, *Acacia mearnsii*). These impacts negatively affect the ability of Palmiet dominated wetlands to perform their ecosystem services resulting in severe erosion of the upper catchment areas, washing away of agricultural land, destruction of infrastructure and excessive deposition of sediment downstream which drowns agricultural land and public infrastructure and also disturbs nearshore aquatic systems.¹⁹ This destruction in the landscape leads to reduced water availability as well as a loss of biodiversity. In light of this, the implementation of protective measures is considered to be key in order to ensure the continued provision of the key ecosystem services Palmiet wetlands provide to the district and avoid the negative impacts that can occur as a result of removing this flora from the catchment.¹⁹

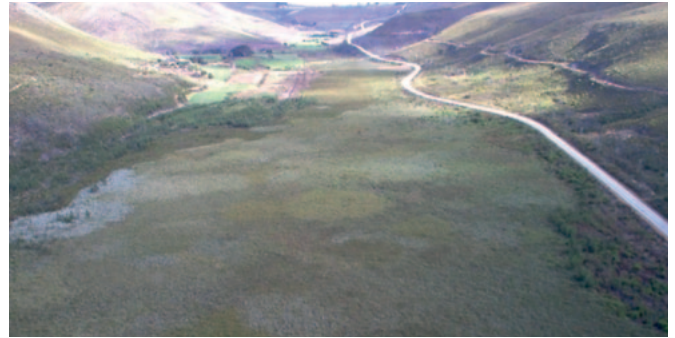


FIGURE 18, 19, 20 & 21: From top to bottom – Palmiet dominated wetland located in the Krom River²², the Palmiet plant²², Palmiet wetland with Black Wattle encroachment along the river bank²³ and flooding at the bottom of the catchment exacerbated by the removal of the Palmiet wetlands upstream.²²

3.3 KEY FLORA AND FAUNA OF THE EDEN DISTRICT MUNICIPALITY WETLANDS *(continued)*

3.3.2 Fauna

In addition to the specially adapted plants that occur within the wetland areas of Eden District Municipality, as noted in Section 3.2 of this report, a number of significant bird, fish and invertebrate species are dependent on the wetlands within Eden District Municipality for their survival.

Of particular significance is the Endangered Knysna Sea Horse or Cape Sea Horse (*Hippocampus capensis*) which can be found only in wetland – estuary interface zones. Historically, the species has been recorded in the Knysna, Keurbooms, Swartvlei, Klein Brak, Groot Brak, Goukamma, Kromme, Kabeljous and Gamtoos Rivers. Current official records however indicate that the species' habitat has reduced to only the wetland-estuary interface zones of the Swartvlei, Knysna and Keurbooms Rivers, a habitat range covering just 27 km².²⁴ The decline in recorded numbers of the species is directly attributed to habitat degradation

resulting from human impacts. Urban expansion and land-use change in the catchment, increase in stormwater runoff carrying sediment and chemical pollutants, increase in waste water discharge, boating and other recreational activities on and around the wetland-estuary interface zone all contribute to a degradation in habitat and result in a decline in the population.²⁴ Furthermore, large scale flooding (which will be exacerbated by the impacts of climate change), substantially alters the habitat in which this species is found as well as washes the species out to sea resulting in dramatic population dips following severe flooding events.²⁴ The 2007 flood, for example, pushed the Knysna Sea Horse almost entirely out of the Keurbooms system and the population has still not yet fully recovered.²⁵ At this stage, the Knysna System has the greatest potential to ensure the long term survival of the species owing to the relatively large resident population in this system.



FIGURE 22: Knysna Sea Horses found in the Swartvlei wetland–estuary interface zone.²⁶

3.4 SHIFTING OF WETLAND SYSTEMS OVER TIME

Currently no formal wetland information database exists for tracking the status and for monitoring shifts in wetland systems within Eden District Municipality.²⁷

In the late 1980s, 65 wetlands throughout the Western Cape Province (including Eden District Municipality) were sampled by a pair of private wetland specialists (Silberbauer and King) to document their current condition. In 2015 these wetlands were revisited by a second team of specialists in order to establish current environmental conditions compared to their condition in the 1980s. A detailed assessment of each wetland was carried out and the current land-use within and around the wetland examined. The results of these assessments were used to derive the overall environmental condition and were compared to the condition during the time of the original survey.²⁸ Some of the key findings found in this study are illustrated in the graphs illustrated in Figure 23 and 24.

In terms of the conservation status of the selected wetlands, 51% of the wetlands have improved, 38% of wetlands are the same and only 2% wetlands have deteriorated. According to the study, the reason for this shift is due to the establishment of new conservation areas as well as the implementation of conservation initiatives and projects from entities such as SANBI and CapeNature. Private stakeholders and land owners working within the area have also resulted in improved protection for some wetlands.²⁸

The overall conclusion from the 2015 study is that although good progress has been made with regard to the management and protection of wetlands within the Western Cape, a more holistic approach is required to ensure effective management overall and reduce further losses and degradation. Additionally, the future of many wetlands located on private land is uncertain. As such, there is a real need to continue the work that is currently being done and there is also an urgent need to incentivise land-owners to protect wetlands on their private properties.²⁸

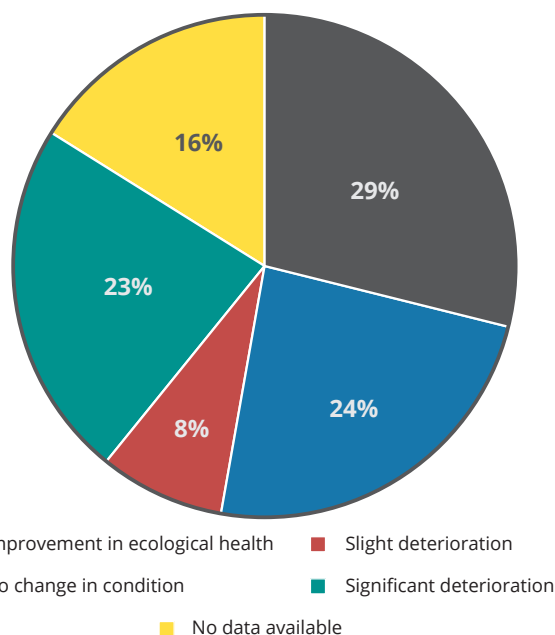


FIGURE 23: Graph depicting the change in ecological health of selected wetlands.²⁸

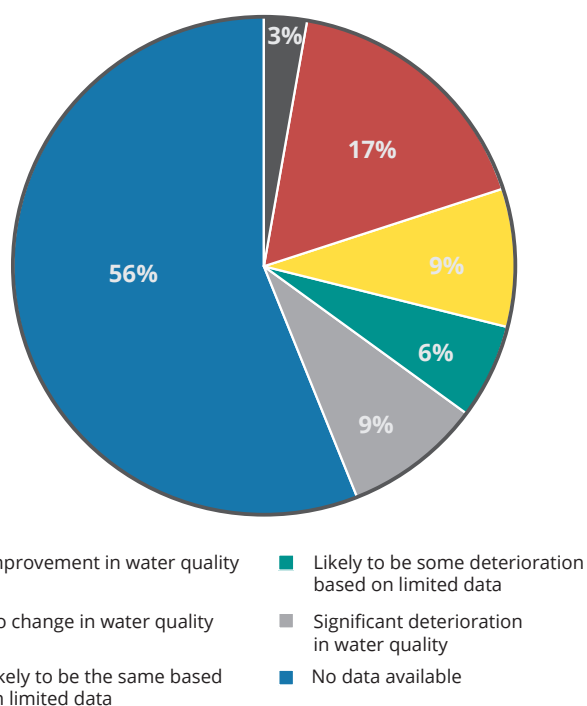


FIGURE 24: Grapha the change in water quality of selected wetlands.²⁸

3.5 STRATEGIC WATER SOURCE AREAS AND CATCHMENT MANAGEMENT WITHIN EDEN DISTRICT MUNICIPALITY

3.5.1 Strategic Water Source Areas within Eden District Municipality

Water Source Areas (WSAs) are sections of the landscape that provide a disproportionate amount of run-off compared to the rest of a given catchment area. South Africa's WSAs are largely spread across the country, however they are generally found in the highest parts of the landscape, receiving high amounts of rainfall. Downstream users and ecosystems are highly dependent on the healthy functioning of WSAs in order to sustain good quality water supplies for human consumption as well as for agriculture. Disrupting the water supply from the WSAs therefore has the potential to have a hugely negative impact on national water and food security.²⁹

Twenty one separate WSAs have been identified in South Africa and can be divided into those of local importance (5) and those of strategic national importance (Strategic Water Source Areas or SWSA), (16). Three WSAs, namely the Langeberg, Swartberg and Tsitsikama, and two SWSAs, namely the Outeniqua and Kougaberg, are located within Eden District Municipality. These are illustrated in Figure 25.²⁹

The Langeberg WSA includes the Breede, Gouritz, Naroo, Duiwenhoeks and Doring Rivers and is the main water source area for the western portion of Overberg District Municipality and the eastern portion of Eden District Municipality. The De Hoop Wetland (RAMSAR site) is also included in this system.²⁹ The Swartberg WSA includes the Gamka, Sand, Dorps, Gouritz and Olifants Rivers and the Tsitsikama WSA includes the Groot Storms, Klip and Tsitsikama Rivers. The Outeniqua SWSA includes the Groot Brak and Olifants Rivers whilst the Kougaberg SWSA includes the Kouga, Baviaanskloof, Olifants, Gamtoos and Gouritz Rivers.

The main threats to the WSA and SWAs within Eden District Municipality include climate change, encroachment of IAPs and fires. The Outeniqua, Kougaberg and Tsitsikama areas are also particularly threatened by large-scale plantations and land degradation.²⁹

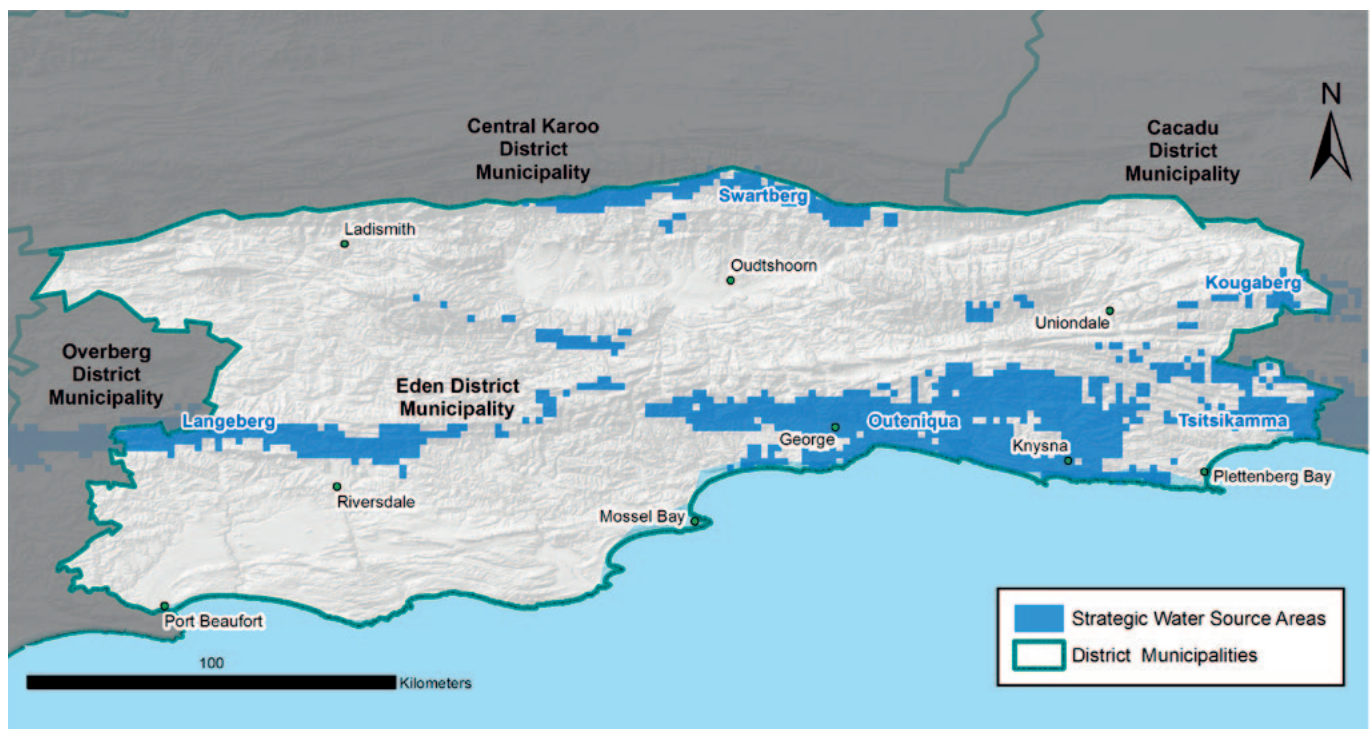


FIGURE 25: WSAs and SWSAs which lie within Eden District Municipality.

3.5 STRATEGIC WATER SOURCE AREAS AND CATCHMENT MANAGEMENT WITHIN EDEN DISTRICT MUNICIPALITY *(continued)*

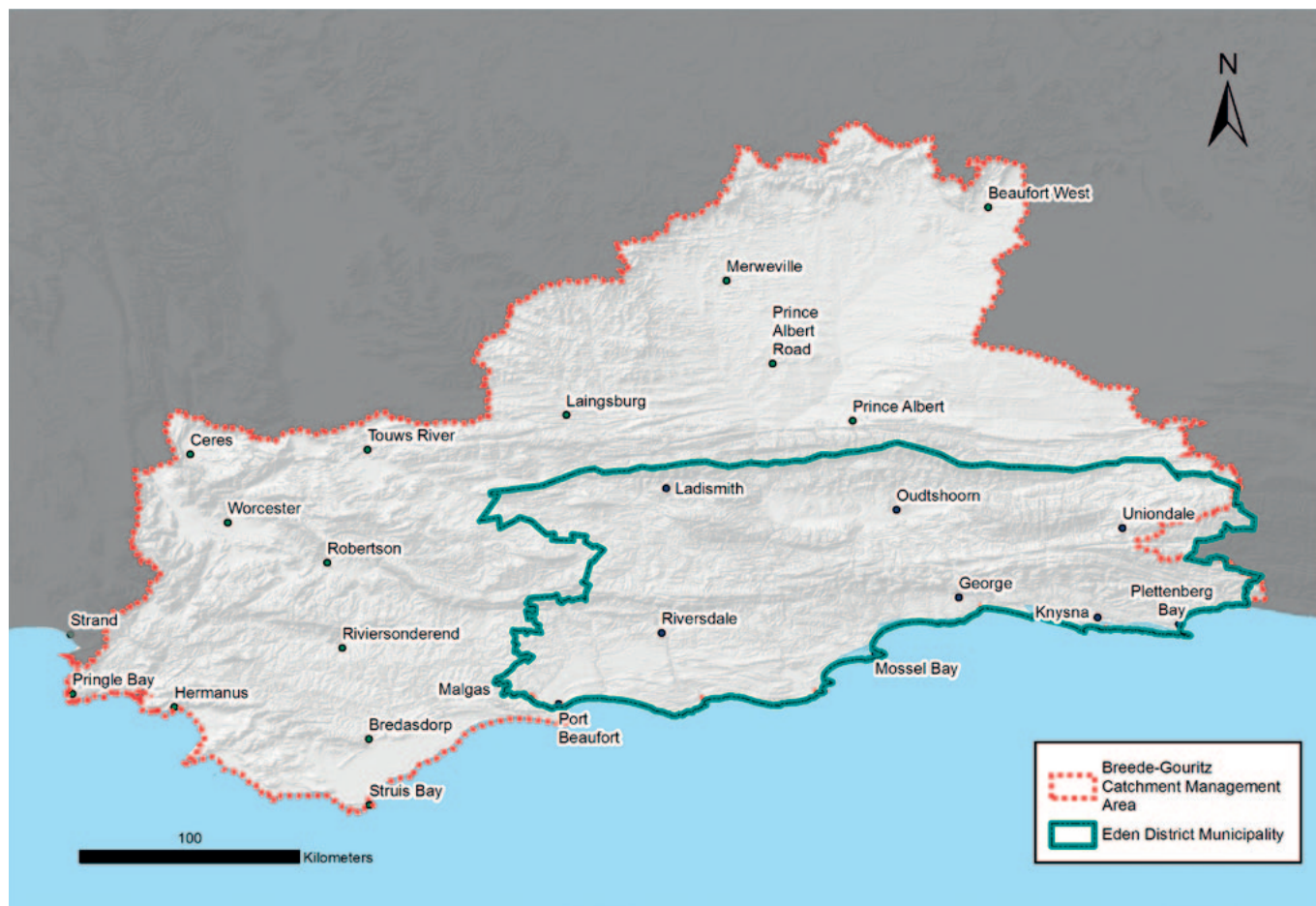


FIGURE 26: Map indicating the geographical extent of the Breede-Gouritz Catchment Management Area.

3.5.2 Catchment Management within Eden District Municipality

Eden District Municipal area encompasses the Breede-Gouritz Water Catchment Management Area (BGCMA). This Catchment Management Area (CMA) extends from the southern coast of Eden District Municipality all the way inland across the Little Karoo and into the Great Karoo. The WMA covers approximately 53 000 km² and includes the bulk of the WSA and SWSA areas mentioned in Section 3.5.2 as well as the Gouritz River and its main tributaries (the Groot, Gamka and Olifants rivers as well as the secondary tributaries, the Touws, Dwyka, Buffels,

Koekemoers, Kamma, Leeu, Touws, Vals, Stink and Kammanassie rivers). Also included in the BGCMA are the Duiwenhoks and Goukou rivers which drain the coastal belt west of the Gouritz River, and several smaller rivers including the Knysna and Keurbooms rivers (refer to Figure 26).³⁰

In terms of wetland occurrence across the CMA, rainfall is a key determinant. High wetland densities are found along the wetter coastal portion of the CMA whilst low wetland densities are found in the drier interior off the BGCMA.³⁰

3.6 THE VALUE OF WETLANDS IN EDEN DISTRICT MUNICIPALITY

As outlined in Section 1: “What is a Wetland” above, wetlands provide innumerable goods and services to local communities and municipalities in the form of provisioning, regulatory, cultural and supporting

services. Following verbal communications with active stakeholders working in Eden District Municipality, the following ecosystem services have been identified and are summarised in Table 1.

TABLE 1 ECOSYSTEM SERVICES IDENTIFIED IN EDEN DISTRICT MUNICIPALITY

ECOSYSTEM SERVICE TYPE	ECOSYSTEM SERVICE	DESCRIPTION/ CASE STUDY
Provisioning	Food	Local communities living within Eden District Municipality harvest local plants such as waterblommetjies and local fish to support their diets (particularly within the Bitou Wetland, Keurbooms Wetland, Klein Brak Estuary, Knysna Estuary and Swartvlei Estuary). ³¹
	Medicinal plants	Many of the plants growing within and around wetlands have natural medicinal properties. Local communities living within Eden District Municipality harvest these plants to maintain/improve their personal health. ³¹
	Raw materials supporting local economies and livelihoods	Wetlands provide a significant number of raw materials which directly contribute to local livelihoods and income. Local communities living within Eden District Municipality harvest reeds from the wetlands to make baskets and furniture, grasses for thatching and Arum lilies to sell on the side of the road. ²⁹ Fishing of local fish to sell on and bait collecting (small juvenile fish, prawns and blood worms) is also common practice particularly in the Bitou wetland, the Keurbooms River and associated wetland and estuary system, the Knysna Estuary and the Swartvlei Estuary to support the local informal fishing industry. ³²
	Clean drinking water	Local communities living within Eden District Municipality, particularly those located in the more rural areas, use clean water supplied by the wetlands for drinking purposes. ³¹
Regulatory	Water storage and stream flow regulation	The local wetlands within Eden District Municipality store stormwater runoff and slowly release the water as the water table drops. This contributes to sustained streamflow throughout the year. ³³
	Flood attenuation and control	Wetlands and the associated plants (particularly Palmiet) play a crucial role in flood attenuation and control as they have the ability to absorb flood water and reduce the velocity of flood waters moving through the system. This contributes to the protection of agricultural land as well as infrastructure downstream. ³⁴
	Erosion control	Wetland plants, particularly Palmiet, strengthen the banks of wetlands and thereby contribute to sediment stabilisation and soil retention within the catchment. ³⁵

continued

3.6 THE VALUE OF WETLANDS IN EDEN DISTRICT MUNICIPALITY *(continued)*

TABLE 1 ECOSYSTEM SERVICES IDENTIFIED IN EDEN DISTRICT MUNICIPALITY

ECOSYSTEM SERVICE TYPE	ECOSYSTEM SERVICE	DESCRIPTION/ CASE STUDY
Regulatory	Water filtration and purification	Wetlands and wetland plants (particularly Palmiet) contribute substantially to improving water quality by filtering and purifying water as it moves through the system. Wetlands have the ability to modify or trap a wide range of substances commonly considered to be pollutants including suspended sediment, excess nutrients, phosphorus, nitrogen, pesticide residue, industrial effluent, pathogenic bacteria and viruses. ³⁶ As such, high concentrations of the above are prevented from reaching groundwater supplies or surface water downstream thus contributing to clean drinkable water. ³⁶
	Climate Change Mitigation	Wetlands have been identified as significant storehouses of carbon. Peatlands, such as those found in the Goukou River wetlands, are estimated to store more than 25 % of the soil carbon pool even though these areas cover only about 3 % of the world's total land area. ³¹
	Protection against the impacts of climate change	Wetlands have the ability to protect both coastal and inland areas against the effects of climatic change (e.g. from increasing frequency and intensity of storms, changing rainfall and temperature patterns as well as changes in seasonality). Please refer to Section 4.2 for further detail in this regard. ³¹
Cultural	Recreation	The wetlands within Eden District Municipality are used extensively for recreation purposes. Activities undertaken within these wetlands include, amongst other things, boating and kayaking along well known birding routes and picnicking along the banks of the wetland systems. Fishing is also a popular recreational and cultural activity in the local wetlands. ³¹
	Tourism	Due to their natural beauty and diversity of plant and animal life, the wetlands within Eden District Municipality are also popular tourist destinations. ³¹
	Education	Wetlands provide ideal spaces for involving the general public and schoolchildren in hands-on learning experiences and to raise awareness of environmental issues in a recreational atmosphere. ³¹
Supporting	Nutrient recycling	Wetlands naturally slow down the flow of water, thereby promoting the deposition and retention of nutrients. These are then utilised by the microbial species living in the wetland habitat which are in turn eaten by larger species such as prawns and blood worms. ³¹
	Supporting habitat	A large variety of bird, fish and invertebrate species are dependent on the wetlands within Eden District Municipality for at least part of their lifecycle. Wetlands provide vital breeding and nursery ground for a variety of fish species as well as breeding, courtship and foraging ground for a variety of bird species. ³¹

3.7 THREATS TO WETLANDS

Despite the huge benefits that wetlands provide in terms of ecosystem services, 50% of wetlands in South Africa have already been lost and 48% of the remaining wetlands are critically endangered and/or degraded.³⁷ This loss is a direct result of historical degradation, deliberate draining of wetlands to make way for development and expansion (both urban and agricultural) and pollution. Damage to wetlands results in increasingly limited functionality and subsequently a decrease in the ability to provide valuable ecosystem services.

Following verbal communications with active stakeholders working in Eden District Municipality, it has become clear that wetlands face a significant number of threats within the municipality, all of which have the ability to either destroy the wetland entirely or severely compromise function and provision of ecosystem services. The key threats to the wetlands located within Eden District Municipality are outlined below:

3.7.1 Historical Degradation

Degradation of wetlands within Eden District Municipality has been occurring since people first settled in the area. It is most likely to have started with the intensive livestock operations of early European farmers³⁸ which caused intense erosion.³⁹ It is also thought that additional degradation of wetlands and watercourses may also have been initiated by use of old access routes – wetlands in the area functioned as the roads for ox wagons carts that transported people and goods through the Karoo prior to the arrival of cars.³⁹ Until very recently, wetlands had also been deliberately filled in so as to ‘reclaim the land’ for urbanisation and agriculture as there was little knowledge available on the value of wetlands and the ecosystem services that they provide.⁴⁰

3.7.2 Urban development and expansion

Wetlands within Eden District Municipality are at risk from both formal and informal urban development and expansion. Due to increasing population particularly in areas such as George, Knysna and Mossel Bay there is a need for more housing. As such, development is being taken right up to, and sometimes beyond, the urban edge threatening wetlands near the vicinity of the urban edge.⁴¹ Due to limited knowledge of where wetlands are on the ground, the development process often entails the accidental draining or infilling of wetlands to make room for these developments.⁴⁰ Additionally, due to limited capacity of municipalities to enforce legislated setback lines, wetlands are also negatively impacted from deliberate development within the system.⁴² The Wilderness Lakes System, the Knysna Estuary and the Bitou Wetland particularly are increasingly threatened by development creep.⁴⁰

In addition to the expansion of formal urban development, there is also an increase in informal developments expanding beyond the formally recognised urban edge. Due to lack of formal planning, these informal settlements are more often than not located inappropriately in wetland areas. In addition to increasing the risk and exposure of communities to environmental hazards such as flooding, the development of informal settlements within wetland areas often brings with it waste disposal into and around the wetland area, which also affects water quality downstream.⁴³

3.7 THREATS TO WETLANDS *(continued)*



FIGURE 27 AND 28: Deliberate clearing of a Palmiet wetland to make way for agriculture (left)⁴⁵ and flooding and subsequent moving of sediment downstream on land that was once a Palmiet wetland.⁴⁵

3.7.3 Converting and using land for agricultural purposes

Since the 1970s, due to lack of knowledge of the value of wetlands and the importance of the ecosystem services they provide, farmers have been deliberately and actively draining and converting wetland land for agricultural purposes because of the relatively fertile alluvial soils, close proximity to water and level land.⁴⁴ The result is that with each flood event, a significant amount of sediment is washed downstream putting infrastructure and livelihoods at risk.⁴³

In addition, the planting of crops such as lemon trees, avocado pear trees and various nut trees as well as converting the land for large scale forestry results in the continuous abstraction of significantly more water than the original indigenous vegetation would have done.⁴⁶ Subsequently, this means that there is significant stream-flow reduction as these man-made plantations and forests hold water that would otherwise have been available for downstream users. Plantation forestry occurs largely in the Mossel Bay, George, Knysna and Bitou local municipalities.⁴¹

3.7.4 Pollution and Effluent Seepage

As noted in **Section 3.7.3**, agriculture and forestry are having a significant effect on wetlands within the municipality and their ability to provide ecosystem services. Dairy farming however, particularly in the coastal catchment area, poses a significant threat to wetlands.⁴⁷ Irrigation of pastures means that excess pesticides and nitrogen seep into the wetland system whilst cleaning of the dairy farms results in the seepage of effluent directly into wetland areas. This results in eutrophication as well as pollution of the wetlands.⁴⁷ This not only poses a risk to the local flora and fauna in terms of habitat contamination, but also poses a health risk to humans in terms of altered water quality. As such, water coming from the wetlands located in close proximity to dairy farms, requires significant treatment before it is safe for human consumption. The Wilderness Lakes in particular are threatened by dairy farming.⁴¹

3.7 THREATS TO WETLANDS *(continued)*



FIGURE 29: Image depicting a small tributary where the water filtration capabilities of wetlands higher up in the catchment is illustrated. The brown water on the left has moved through a wetland that has been compromised by land use change whilst the clear water on the right has moved through a pristine wetland that has not been impacted by human activities.⁴⁸

As a result of expanding urbanization in close vicinity to wetland areas, ageing and failing waste water treatment infrastructure and extremely poor stormwater runoff monitoring and management, the wetlands within Eden District Municipality are also at a very high risk from polluted stormwater runoff as well as from sewerage seeping into wetland areas. The Keurbooms wetland and river system, Knysna Estuary as well as the Bitou wetland are all at high risk from pollution and runoff from the adjacent urban areas.⁴⁹ The effect of this includes increased nutrient loads as well as *E.coli* levels within in the wetland and estuarine systems which negatively affects the delicate biodiversity depending on these systems for survival.⁵⁰

3.7.5 Water Abstraction

As noted in **Section 3.5.2**, Eden District Municipality falls within the Breede-Gouritz Catchment Management Area. In the northern inland part of the district, evaporation exceeds rainfall meaning that these are water stressed areas. In contrast, rainfall largely matches evaporation in the southern part of the district meaning that these are generally moister environments. More than half of the water currently used in the drier inland areas of the district is abstracted from groundwater and wetlands in order to meet water needs of the local population, including for agricultural purposes. In light of this, the inland wetlands are under severe pressure.⁴⁰

3.7 THREATS TO WETLANDS *(continued)*

Pressure on all the wetlands within the municipality however is only likely to increase. Between 1996 and 2001 the population of the municipality increased by 19.4% and by 2020 it is anticipated to increase by 35%, particularly in the Sedgfield, Plettenberg Bay and Wilderness areas.⁴⁰ Water provision services across the municipality will have to expand to service this population growth, placing more pressure on the local water resources. In addition, low cost housing projects emerging from the National Reconstruction and Development Programme (RDP), together with the National Water and Sanitation Programme have contributed to additional water demand.⁴⁰

3.7.6 Encroachment of Invasive Alien Plants (IAPs)

Invasive plant and animal species, introduced by human actions either accidentally or intentionally, are proving a major threat to the quality and quantity wetlands, as well as to the biodiversity within Eden District Municipality.⁴⁰ IAPs have the ability to alter local water quality, displace indigenous plants (and subsequently the fauna that depends on that vegetation for survival) and ultimately alter the habitat and change ecosystem functioning to suit themselves.⁴⁰ IAPs are also 'thirsty' as they draw a far greater amount of water than the local indigenous vegetation resulting in a reduced amount of water moving through the system to downstream users.⁴⁰

One such example of the negative impacts of IAPs on wetlands is from the Malgaat River and associated wetland system. The Malgaat River and wetland was once a pristine Palmiet dominated system near the Mossel Bay area; however Black Wattle (*Acacia mearnsii*) has encroached into the wetland and compromised the system. The Black Wattle trees overshadow the Palmiet causing it to die off due to lack of sun exposure. This creates space for the IAPs to encroach into the wetland further. Few plants can grow under these trees and as such, when heavy rainfall occurred in 2007, huge floods moved through this system resulting in extensive erosion and the movement of a significant amount of irreplaceable sediment downstream.⁴¹ The wetland is now significantly degraded and can no longer perform

key ecosystem services such as flood attenuation and water filtration.⁴¹ The Malgaat wetland is not the only wetland to be impacted by IAPs however. The Kaaimans, Karatara, Moordkuil, Duiwenhoeks, Goukou, Keurbooms and Salt River and wetland systems, the Upper Knysna catchment as well as the Vankankersvlei, Groenvlei and Tshokwane wetlands, to name a few, are also under severe threat from IAPs.⁴¹



FIGURE 30 AND 31: From top to bottom- Flowering Black Wattle tree and the Blue Gum tree.

4 | DISASTER MANAGEMENT AND CLIMATE CHANGE

“ *Disaster means a progressive or sudden, widespread or localised, natural or human-caused occurrence which is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.* ”

Disaster Management Act No. 57 of 2002

“ *Disaster Management means the systematic process of using administrative directives, organisations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster. This term is an extension of the more general term ‘Risk Management’ to address the specific issue of disaster risks. Disaster Risk Management aims to avoid, lessen or transfer the adverse effects of hazards through activities and measures for prevention, mitigation and preparedness.* ”

Eden District Municipality: Disaster Risk Assessment, 2013

4.1 DISASTER RISK MANAGEMENT IN THE EDEN DISTRICT MUNICIPALITY

The Disaster Management Act (Act No. 57 of 2002) stipulates that every Metropolitan and District Municipality within South Africa must establish and implement a framework for disaster management within the municipality. This is to ensure that each municipality takes responsibility for hazard monitoring and risk mapping (“disaster risk assessment”), takes the necessary remedial steps to prevent and/or mitigate the occurrence or re-occurrence of disasters in their area of jurisdiction and that there is an integrated and uniform approach to disaster management.

The review and update of the current district level Disaster Risk Assessment (DRA) of Eden District Municipality was completed in the March 2013 by Disaster Risk Management (Pty) Ltd on behalf of and with the support of the Western Cape Disaster Management (WCDM). The methodology used for the update of the current Disaster DRA is based on a review of the Risk Assessment performed by SRK Consulting in 2005 and by using scientific research methods comprised of desktop research and interviews with relevant district and provincial stakeholders, and finally compiling GIS maps of Eden District Municipality. The DRA was undertaken with the aim of providing relevant disaster risk managers

and municipal role-players within Eden District Municipality with a user-friendly working document focusing on pertinent risks in the municipality.

The DRA describes the major risks or threats to the municipality, the consequences thereof and the likelihood of the threat occurring. The DRA also identifies the required procedures to ensure the prevention and mitigation of major incidents or disasters to ensure an effective response. Also highlighted in the DRA is information on who has the capabilities and who should be responding to each of the identified threats on a primary and secondary level. The measures included within the DRA are largely proactive but reactive measures are also provided for incidents should they occur.

The aim of the 2013 DRA is to provide up to date information to assist district and local role-players to avoid disaster risks, plan for and reduce disaster risks, as well as to respond effectively in the case of a disaster in order to reduce the potential impact on people, property and the environment. The current DRA complies with the requirements of the Disaster Management Act, 2002 (Act 57 of 2002).

4.1 DISASTER RISK MANAGEMENT IN THE EDEN DISTRICT MUNICIPALITY *(continued)*

4.1.1 Risk identification and mapping

As noted previously, the DRA compiled for Eden District Municipality identifies the major risks or threats to the municipality. Of the risks identified in the assessment, in terms of human livelihood and costs incurred to the municipality, flooding and flash flooding, drought, wild fires and extreme weather events were ranked as the most severe threats to the district.

Between 2005 and 2013, Eden District Municipality was hardest hit by heavy rainfall and associated flooding and flash flooding events with serious financial consequences. In January 2005, flooding in the Mossel Bay area cost the municipality R 2.5 million in repairs whilst in August 2006, floods across the entire district cost the municipality R 275 million. Flooding in November 2007 was the worst for the twelve year period, amounting to a staggering total of R 1.1 billion in damages. Subsequent floods throughout the district in 2011 and 2012 amounted to R 485 million and R 13.5 million respectively. In total, in the last twelve years, impacts associated with flooding (loss of

infrastructure, damage to roads etc.) have cost Eden District Municipality nearly R 2 billion.⁵¹

Given the huge financial impacts associated with flooding in Eden District Municipality, an early warning system is essential for the municipality to monitor for severe weather patterns and react in advance. Over and above the severe weather warnings distributed by the South African Weather Service there are several "local" early warning systems operating in the Eden District Municipality including the flood early-warning system developed by National Sea Rescue Institute (NSRI) Station in Plettenberg Bay ('NSRI Plett'). This links information on upper catchment rainfall and water levels to the likelihood of downstream flooding. In addition, since the November 2007 floods, Sedgefield residents and the Eden District Disaster Manager have worked together on a flood contingency plan. There is now a new local early-warning system in place. This actively includes Sedgefield residents, the Eden Disaster Manager, the Knysna Disaster Manager and the South African Weather Service.⁵²



FIGURE 32: Images of the impacts of the 2007 flood on the town of Sedgefield.⁵¹

4.1 DISASTER RISK MANAGEMENT IN THE EDEN DISTRICT MUNICIPALITY *(continued)*

Whilst flooding has had a huge financial impact in Eden District Municipality in recent years, similarly drought, and the associated fires that happen as a result of the drying of the vegetation, has also had severe impacts in the municipality. Between 2010 and 2011, a severe drought hit the municipal area. The direct costs of the drought (particularly in terms of loss in agricultural productivity and costs of continuing to meet the water requirements) cost the municipality R 300 million. Fires occurring during this same period

in the Kouga Mountain region (2011) and Albertina region (2012) cost the municipality R 1 million and R 2 million in damages respectively.⁵¹

In addition to flooding, drought and fire, inconsistent water supply, storm surges, seismic events and earthquakes, soil erosion, loss of biodiversity, livestock epidemics and air and groundwater pollution were also found to be threats to Eden District Municipality.⁵²

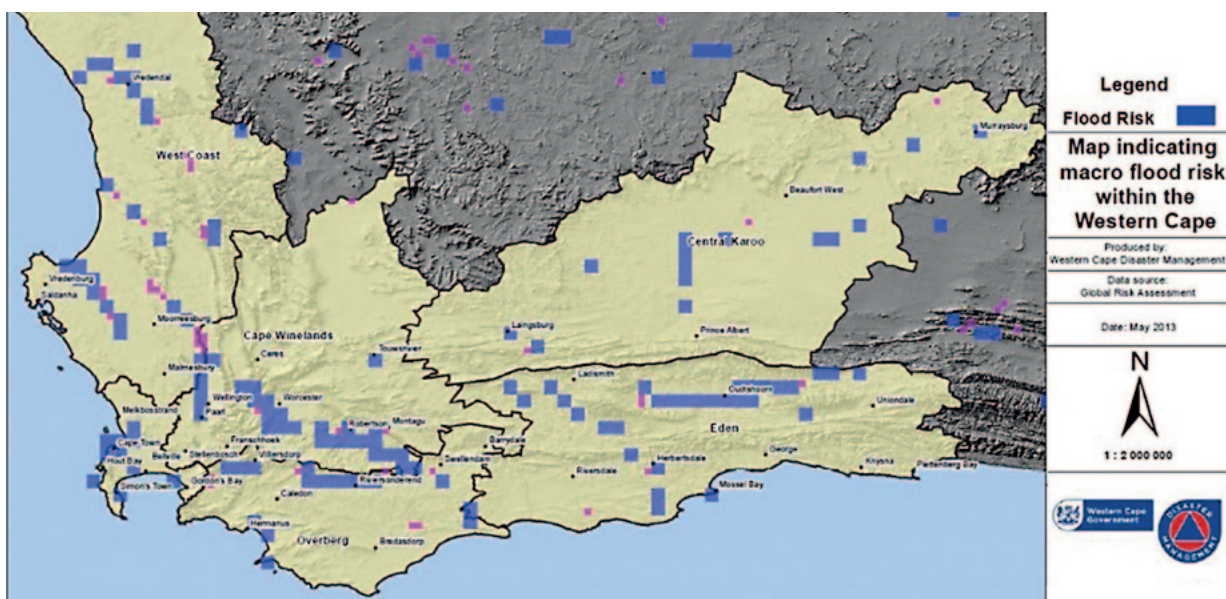


FIGURE 33: Map indicating the flood-prone areas (marked in blue) within the Western Cape.⁵³

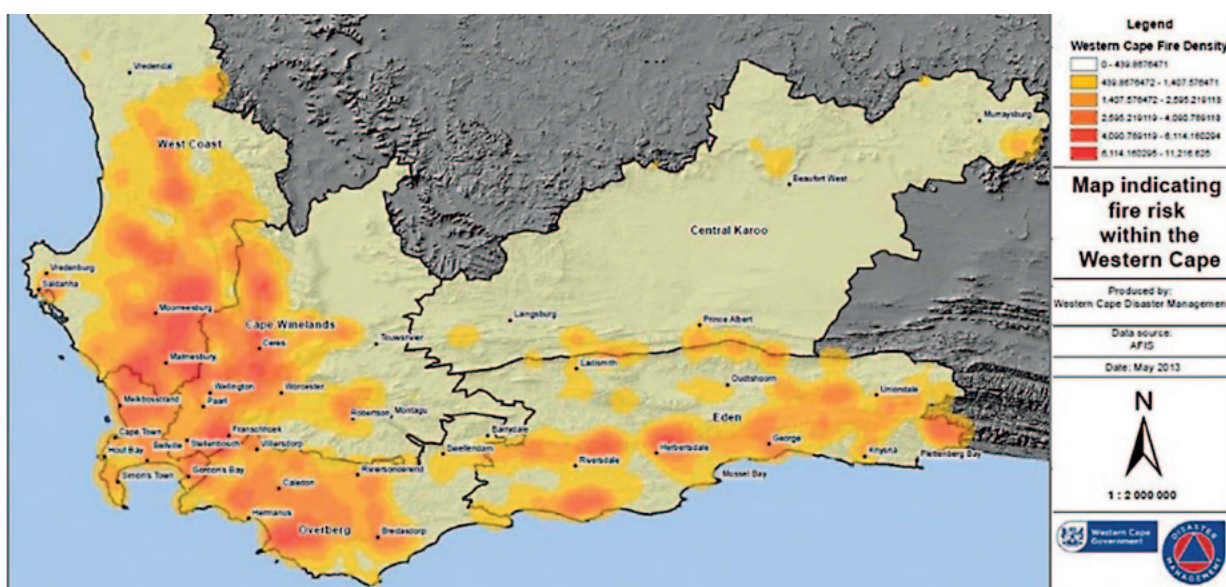


FIGURE 34: Map of the fire risk areas (marked in yellow and orange) within the Western Cape.⁵³

4.1 DISASTER RISK MANAGEMENT IN THE EDEN DISTRICT MUNICIPALITY *(continued)*

4.1.2 Role of Wetlands in Disaster Risk Mitigation

As noted in Section 3.6, wetlands are considered to be high-value ecological infrastructure as they provide a substantial number of ecosystem services to the surrounding local area as well as downstream. Wetlands also have the natural ability to buffer and

reduce the impacts of a substantial array of disasters including flooding, inconsistent water supply, drought, soil erosion, loss of biodiversity and groundwater pollution. Given that these are considered to be some of the main risks to Eden District Municipality, wetlands can play a key role in disaster risk mitigation within the district. This is summarised in Table 2.

TABLE 2 ROLE OF WETLANDS IN DISASTER RISK MITIGATION IN EDEN DISTRICT MUNICIPALITY

DISASTER	ROLE OF WETLANDS IN DISASTER RISK MITIGATION ⁷
Flooding	Wetlands have the ability to reduce the velocity of flowing water and absorb some of the water into the wetland system. As such, rather than the flood water moving through the system in one go, water is retained and released at a slower rate. This means that not only is the intensity of the flood reduced or prevented all together, thereby reducing the potential impact on infrastructure and housing downstream, but there is sustained water flow long after the rainfall event.
Inconsistent Water Flow & Drought	Wetlands have the ability to act like sponges in that throughout the rainy season they absorb water. During the dry season, and even in times of drought, this water is slowly released thereby ensuring that rivers and streams maintain sustainable flows and supply continuous water despite lack of rainfall.
Soil Erosion	Due to the fact that wetlands are covered by specially adapted vegetation such as the high value Palmiet plant, little to no erosion occurs in wetland areas as the wetland plants have the ability to stabilise and bind the soil, reducing the risk of top soil loss downstream.
Loss of Biodiversity	Wetlands can be considered as biodiversity hotspots in themselves as they provide key habitat to a number of plant and animal species. Often these species are considered to be unique and are completely dependent on the system. Maintaining healthy wetlands therefore can contribute to halting loss of biodiversity within the municipality.
Groundwater Pollution	Wetlands have the ability to purify water by trapping pollutants, sediments, excess nutrients (especially nitrogen and phosphorus), heavy metals, disease-causing bacteria and viruses, and synthesized organic pollutants such as pesticides, thereby ensuring that the water leaving the wetland is cleaner than the water that entered it.

4.2 CLIMATE CHANGE AND WETLANDS IN EDEN DISTRICT MUNICIPALITY

‘Climate change’ means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

United Nations Framework Convention on Climate Change (UNFCCC)

In simpler terms, climate change can best be described as a long term change in the Earth’s global climate patterns including shifts in historical seasonality, rainfall patterns and average temperature ranges. These shifts are caused by an increase in global temperatures which are caused by increasing greenhouse gases (e.g. carbon dioxide) being emitted into the atmosphere. The rising of greenhouse gases in the atmosphere is caused by large scale human activities including industry, agriculture, transport and land use change. As a result, the long term historical climate is shifting towards unstable and unpredictable future climate conditions.

4.2.1 Historical climate in Eden District Municipality

The Western Cape has a Mediterranean climate meaning that is subject to hot, dry summers and cool wet winters. The climate within Eden District Municipality is also strongly influenced by the local topography as well as the district’s proximity to the Atlantic and Indian Oceans.

In terms of temperature, historically there has been a strong seasonality between the winter and summer months. This is more pronounced as one moves further inland. As illustrated in **Figure 35**, the coolest month has historically been July whilst the hottest month has been February. In terms of rainfall, unlike temperature which historically has been strongly tied to the seasons, rainfall occurs throughout the year within Eden District Municipality with the strongest rainfall events occurring during the winter months. Summer rainfall is largely orographic, caused by the topography of the district, whilst the heavier, more intense winter rainfall is caused by cold frontal systems moving in from the southern Atlantic Ocean. Historically, flooding is associated with the stronger cold front systems in the winter months whilst dry spells/drought, particularly inland, are associated with the warmer summers.

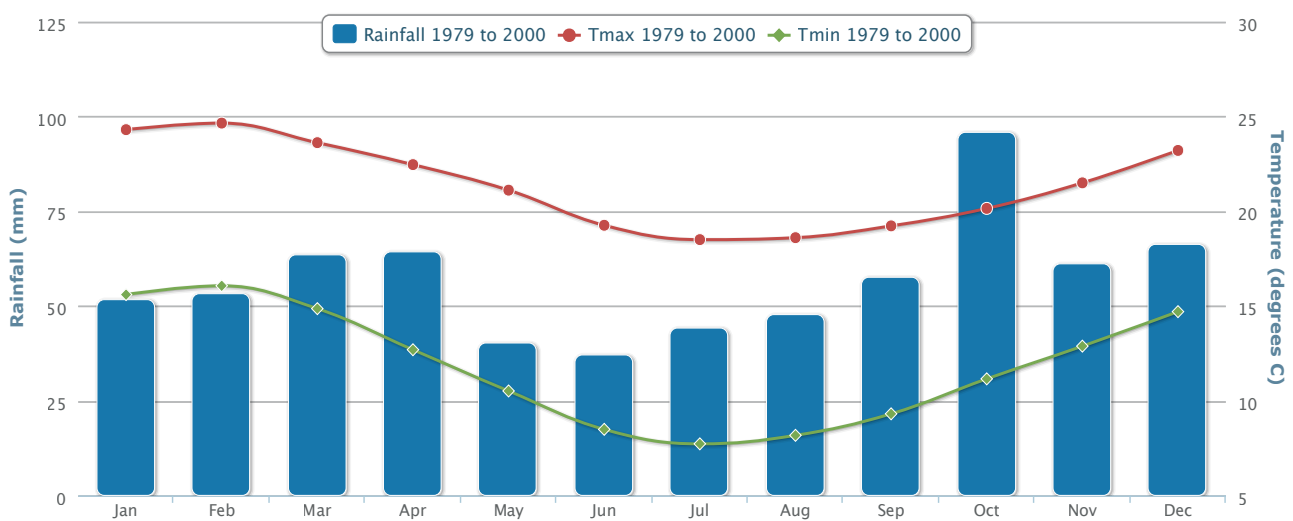


FIGURE 35: Graph depicting the typical climate of Eden District Municipality.⁵⁵

4.2 CLIMATE CHANGE AND WETLANDS IN EDEN DISTRICT MUNICIPALITY *(continued)*

Due to difference in local topography and the close proximity of the ocean, there is a strong gradient of change in terms of temperatures and rainfall as one moves inland. Coastal temperatures within the municipality are temperate and marginally cooler, whilst inland temperatures are generally much warmer and have a much greater temperature variation between winter and summer months. Rainfall varies across the district for the same reason. High rainfall occurs along the coast and low rainfall occurs further inland of the municipality.⁵⁶ In addition, inland rainfall also appears to be more seasonal in that peaks of rainfall appear towards the end of winter and summer.

4.2.2 Projected Climate Change in Eden District Municipality

The Climate Systems Analysis Group (CSAG) from the University of Cape Town (UCT) has developed the Climate Information Platform (CIP) which provides climate related information. The CIP runs a series of climate models which collectively provide a database of historical climate patterns as well as future projections for regions and districts throughout the world.

Temperature:

In terms of temperature, the climate models all agree that warming within Eden District Municipality will most certainly occur and that there will be a definite overall increase in average monthly temperatures by 1–2.5°C. The data also indicates that summer temperatures will increase slightly more than winter months and that there will be a lengthening of the summer months. Also indicated is an increase in the number of hot days exceeding 32°C.

Rainfall:

In terms of rainfall, the climate models all agree that a shift in the historical rainfall patterns will most certainly occur. The models however do not agree on the direction of change and as such there is uncertainty as to whether there will be an increase or a decrease in annual rainfall in the municipality. The changes in rainfall and temperature will however result in a shift in seasonality. As such, it is anticipated that there will be a decrease in peak winter rainfall and an increase in rainfall in the autumn and spring months (February and September). Despite the uncertainty however, the models do indicate that there will be a shift to generally drier conditions overall throughout the municipality with the exception of the mountain areas which are anticipated to become wetter.⁵⁶

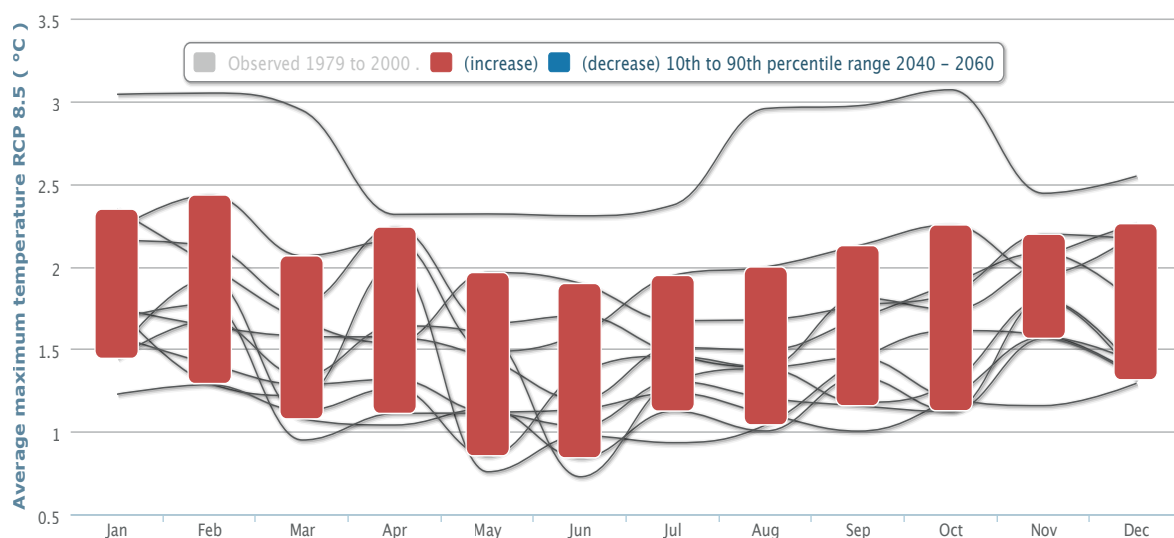


FIGURE 36: Graph depicting the anticipated changes in average maximum temperature patterns for Eden District Municipality.⁵⁵

4.2 CLIMATE CHANGE AND WETLANDS IN EDEN DISTRICT MUNICIPALITY *(continued)*

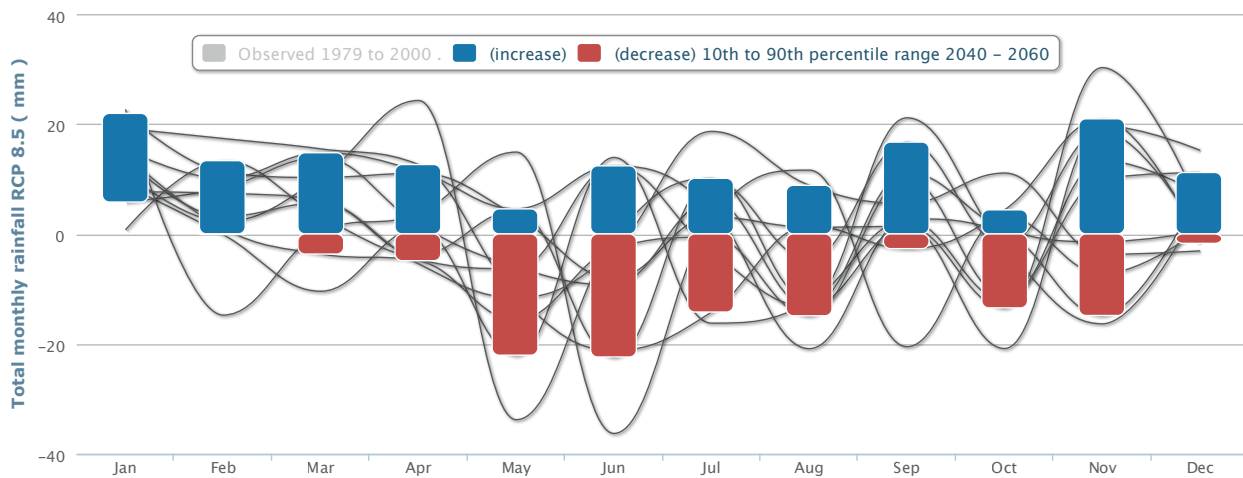


FIGURE 37: Graph depicting the anticipated changes in total monthly rainfall patterns within Eden District Municipality.⁵⁵

4.2.3 Impacts of Climate Change in Eden District Municipality

Eden is located in a climatically sensitive region and as a result has historically been annually hit with significant climate related disasters. As noted in **Section 4.1.1**, in just the past decade Eden District Municipality has been hit with several strong flooding, drought and fire events which have had significant financial related impacts.

A shifting climate means that the historical seasonality and rainfall and temperature patterns no longer apply. The predicted increase in temperature will result in, on average, hotter days throughout the year, as well as an increased likelihood of hot spells and heat waves occurring more frequently in the summer months. The uncertain changes in rainfall patterns however mean that resulting impacts could go one of two ways. Should there be an increase in annual rainfall, there will also most likely be an increase in the magnitude and frequency of storm events (i.e. more severe storms happening more often) resulting in an increased number of annual flooding incidents (and very likely increased severity), particularly in the later winter and early spring months. Should there be a decrease in rainfall however, there will be an increased number of annual dry days resulting in subsequent increased risk of

water scarcity and drought as well as more intense fires occurring throughout the district.

In short, climate change in Eden District Municipality will result in an exacerbation of the existing impacts historically occurring within the municipality namely flooding and drought with associated fires. As such, Eden District Municipality should therefore continue to plan for historical climate related impacts and be mindful that these impacts will most likely become more severe over time.

4.3.4 Role of Wetlands in mitigating and adapting to the impacts of climate change

Wetlands and their associated ecosystem services provide effective tools for both mitigating and adapting to the impacts of climate change. In terms of climate change mitigation, wetlands are well known for being carbon sequestering systems (aka “carbon sinks”). That means that wetlands have the ability to store excess carbon (via photosynthesis) from the atmosphere – one of the primary components of greenhouse gases and a driver of climate change.⁵⁷ Protecting wetlands can therefore assist in preventing further climate change by reducing the quantity of carbon in the atmosphere. Drainage and degradation of wetlands however can release significant amounts of this stored carbon back into

4.2 CLIMATE CHANGE AND WETLANDS IN EDEN DISTRICT MUNICIPALITY *(continued)*

the atmosphere and reduce the ability of wetlands to sequester additional carbon.⁵⁷ Better management practices thus can help protect these stores of carbon and the ability of wetlands to sequester it.

In terms of adaptation, wetlands have the ability to act as natural buffers to the most severe of climate change impacts. For example, as noted in **Section 3.6**, wetlands have the ability to soak up heavy rainfall and attenuate flood water protecting the district against the most extreme of floods. Wetlands can also store water and release it slowly in drier times which protects the district against the more severe impacts of drought.

Climate change however can have a negative impact on wetlands if they are not in a healthy condition. Wetlands which are in poor condition have a reduced ability to respond and adapt to a shift in climate which means climate impacts (e.g. flooding) are more likely to damage or destroy the wetland. Subsequently the wetland is compromised in its ability to perform vital ecosystem services (including most importantly flood

attenuation, water storage and flow regulation) and provide habitat for the specialised species living in these wetlands. Healthy wetlands however have a high resilience to climate change impacts, meaning that they are able to maintain their capabilities to supply ecosystem services and continue provide key habitat to the specialised flora and fauna despite significant shifts in climate.

Given that healthy wetlands are able to maintain their ecosystem services, they are able to play a highly significant role in reducing the impacts of climate change within the municipality. Investment in the maintenance of healthy wetlands and the rehabilitation and restoration of damaged or degraded wetlands therefore will not only ensure wetland resilience to climate change but will ensure increased resilience of the municipality to the impacts of climate change. Armed with this knowledge, Eden District Municipality is taking steps to protect their wetlands to ensure the continued storage of carbon and reduce all other threats as far as possible to build resilience to future climate change.⁵⁷

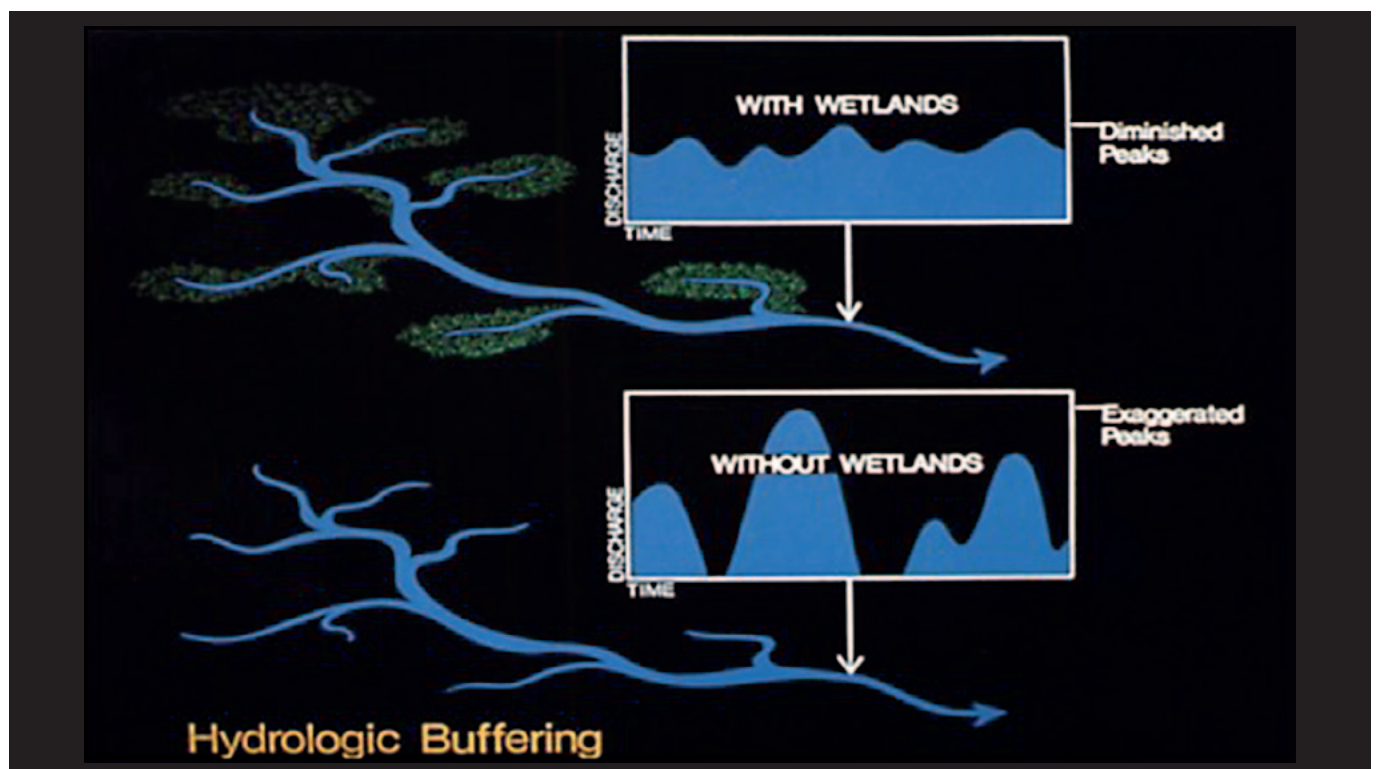


FIGURE 38: Schematic representation on the hydrological buffering capability of wetlands.

5 | GOVERNANCE & MANAGEMENT

South Africa has an extensive legislative framework concerning the environment and biodiversity is considered in both development planning as well as national government priorities. This section outlines

key legislation and policies as well as the governance structure within Eden District Municipality which leads to the current wetland management strategy within the district.

5.1 POLICY FRAMEWORK

Table 3 provides a comprehensive summary of all South African legislation, policies and strategies pertinent for the management of wetlands within Eden District Municipality. It is important to note that some of the legislation such as the National

Environmental Management Act (NEMA) provides specific instructions regarding wetland management whilst other legislation indirectly supports management of wetlands such as the National Environmental Management: Waste Act (NEM:WA).

TABLE 3 LEGISLATION GOVERNING WETLAND MANAGEMENT IN EDEN DISTRICT MUNICIPALITY

LEGISLATION/ POLICY/ STRATEGY	HOW IT RELATES TO WETLANDS
Legislation	
South African Constitution	Overarching principles of care for the environment.
Environmental Conservation Act and associated By-Laws	Controls access to and activities within coastal and wetland areas.
National Water Act	Water use control, including extraction and construction within the vicinity of a watercourse or wetland.
National Environmental Management Act	Environmental impact assessments (EIAs) for the development of a new or disturbed site within the vicinity of a watercourse or wetland.
National Environmental Management: Biodiversity Act	Protection of biodiversity and the formulation of a number of tools (e.g. bioregional plans and threatened ecosystem lists) that feed into land use planning and EIA procedures.
National Environmental Management: Biodiversity Act - Alien and Invasive Species Regulations	All matters related to invasive species management (both fauna and flora).
National Environmental Management: Integrated Coastal Management Act	Protection of coastal landscapes and sensitive areas, which often include wetlands.
National Environmental Management: Protected Areas Act	Protection of national parks, protected areas and conservation sites. This includes the protection of wetland sites.
National Environmental Management: Waste Act	Regulation of illegal dumping.
Conservation of Agricultural Resources Act	Protect the utilization of the natural agricultural resources to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invasive plants.
Municipal Systems Act	Role of local governments and the requirements for IDPs, SDFs and Disaster Management Plans.
Municipal Structures Act	Promotion of regional planning and spatial planning categories.
Municipal Health Act	Monitoring of WWTW discharge.

continued

5.1 POLICY FRAMEWORK *(continued)*

TABLE 3 LEGISLATION GOVERNING WETLAND MANAGEMENT IN EDEN DISTRICT MUNICIPALITY

LEGISLATION/ POLICY/ STRATEGY	HOW IT RELATES TO WETLANDS
Policies	
National Development Plan, and associated Medium Term Strategic Framework.	Sets out measures to protect natural resources in South Africa. Through the creation of the MTSF and associated 'Delivery Agreements', required outputs and targets are set.
Municipal Planning	
Integrated Development Plan (IDP)	Overall strategy document for the municipality.
Provincial Strategic Development Framework (SDF)	Overarching spatial planning guidelines for the province.
District SDF	Broad spatial planning guidelines for the district (including a map of land use within the district).
Local Municipal SDFs	Strategic plans to manage municipal land at the local level.
Open Space Framework	Demarcation of Open Space Areas.
Environmental Management Framework	Map and land use guidelines for areas of environmental importance.
Sector Plans	This includes the Disaster Management Plan.
By-Laws	Boating By-Law which regulates recreational activities on the Keurbooms River.
Strategies	
The National Biodiversity Framework	Provides biodiversity targets for South Africa.
National Water Resource Strategy	Speaks to protection and rehabilitation of wetlands.
Other	
Bioregional plans (draft or gazetted)	Maps Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs).
Spatial Planning and Land Use Management Act	Provides a framework for spatial planning and land use management in South Africa. It also stipulates that municipal planning is primarily the executive function of the local sphere of government and requires that biodiversity is adequately considered in spatial planning.
Disaster Management Amendment Bill	Outlines how ecosystems should be considered in the updated Disaster Management Act.

5.2 WETLAND MANAGEMENT WITHIN THE MUNICIPALITY

Taking the above legislation into account, the strategic objectives for Eden District Municipality as per the current IDP (2012–2017) are currently as follows:

1. Healthy and socially stable communities.
2. Build a capacitated workforce and communities.
3. Conduct regional bulk infrastructure planning, implement projects, roads maintenance & public transport; manage & develop council fixed assets.
4. Promote sustainable environmental management & public safety.
5. Ensure financial viability of the Eden District Municipality.
6. Promote good governance.
7. Grow the district economy.

Currently there is no specific designated wetland management authority within Eden District Municipality.⁵⁸ Instead, the management of wetlands is a collective but disconnected effort between the various departments of Eden District Municipality, the six local municipalities with Eden District Municipality, parastatals such as CapeNature and SANParks and private stakeholders. Various forums also inform wetland management and include the Southern Cape Wetlands Forum (SCWF), which is required to provide input towards prioritising wetlands for funding and rehabilitation, as well as the Plett Environmental Forum, the SANParks Forum, the Fynbos Forum, the Knysna Catchment Management Forum and the Wilderness Lakes Catchment Management Forum.⁵⁹

At this stage, management of wetlands is extremely fragmented across Eden District Municipality. The district and local municipalities work from separate IDPs with different mandates as such, environmental management within the individual municipalities is not consistent.⁶⁰

In addition, different local municipalities have different capacity levels for effective environmental management. Within Bitou and George Local Municipalities for example, there are currently no dedicated environmental officers and as such there is no capacity for any environmental management within these municipalities.⁶¹ Knysna Local Municipality is highly active in terms of their environmental management, however at this stage there is no capacity for enforcement, which limits their effectiveness on the ground.⁶²

Parastatals such as SANParks and CapeNature are highly effective in terms of the land that they manage however these entities only cover certain sections of land within the municipality. SANParks exclusively manages the national parks areas whilst CapeNature manages land where Working for Wetlands is working on wetland rehabilitation projects. Private land, which is interspersed between state and municipal owned land located in between, is managed as is seen fit by the separate municipalities and individual landowners. As such, there is no holistic management of wetlands and due to differences in agendas of each entity, there is little to no cooperative action between parties which puts wetlands at risk from mismanagement.⁵⁴

In light of the above, in order to ensure holistic and effective management of wetlands within Eden District Municipality, the same vision and standardised goals for the management of wetlands needs to be incorporated into the IDPs and SDFs of both the local and district level municipalities.⁵⁴ It would also be ideal if Eden District Municipality could provide support to the local municipalities where possible in order to assist with the identified capacity constraints within these municipalities.⁵⁴ Additionally, using platforms such as the SCWF will ensure better communication between both the district and local municipalities as well as the parastatals and private landowners to manage wetlands collectively.

6 | LOCAL AND REGIONAL PARTNERSHIPS AND PROGRAMMES

In addition to the collective work that is being undertaken to monitor and manage wetlands within Eden District Municipality, there are numerous projects and activities currently being implemented

within and around wetlands by both the public and private sector as well as several NGOs. The known projects currently underway within Eden District Municipality are summarised in **Table 4**.

TABLE 4 LOCAL AND REGIONAL WETLAND RELATED PARTNERSHIPS AND PROGRAMMES WITHIN EDEN DISTRICT MUNICIPALITY

PROJECT NAME	PROJECT DESCRIPTION	PROJECT IMPLEMENTING ENTITY
Eden to Addo Corridor Initiative	The aim of the Eden to Addo Corridor Initiative is to link three mega-reserves, namely the Garden Route National Park, the Baviaanskloof Mega Reserve and the Addo Elephant National Park by means of natural corridors to protect and restore the integrity of bio-diversity, eco-system functioning and ecosystem services. This includes rivers and wetlands. ⁶³	Eden to Addo Initiative (Public Benefit Organisation)
Bitou Valley Foundation	The aim of the Bitou Valley Foundation is to develop the Bitou Wetland to be a “world class wetland” that will enhance the functioning of the wetland, attract tourists to the area and stimulate the development of small businesses and job creation to the benefit of the people, wild inhabitants and natural environment of the Valley. As part of the project, a wetland management and rehabilitation plan is currently being produced which will guide conservation actions going forward. ⁶⁴	Bitou Valley Foundation with support from WESSA, UNDP, GEF and the GEF: Small Grants Programme.
Wetland Delineation Project within SANParks Land	SANParks have surveyed certain wetlands within the Knysna Protected Environment with the aim of identifying wetlands beyond the 50 metre river buffer in order to ensure accurate comments on future development applications whereby these wetlands may be impacted. ⁶⁵	SANParks
Knysna Basin Project	The Knysna Basin Project is a scientifically based non-profit organisation focused on continued research in the Knysna Basin. The aim is to promote international research collaborations with the specific intention of promoting the management and protection of the river, wetland and estuary areas within the Knysna Basin as well as the associated flora and fauna. ⁶¹	Knysna Basin Project with support from Rhodes University, Thesen Islands and Barloworld.

continued

6.1 WETLAND MANAGEMENT WITHIN THE MUNICIPALITY

TABLE 4 LOCAL AND REGIONAL WETLAND RELATED PARTNERSHIPS AND PROGRAMMES WITHIN EDEN DISTRICT MUNICIPALITY

PROJECT NAME	PROJECT DESCRIPTION	PROJECT IMPLEMENTING ENTITY
Alien clearing within SANParks land and buffer zones	SANParks is undertaking IAP clearing throughout SANParks land within Eden District Municipality (including within and around wetland areas). ⁶¹	SANParks
Alien Clearing Initiative	Mossel Bay Local Municipality is currently undertaking extensive IAP clearing in order to release additional water resources for the local municipality. IAP clearing is also being undertaken in and around known wetlands within the local municipality. ⁶⁶	Mossel Bay Local Municipality
Adopt-A-River Programme	The DEA River Health Programme developed the Adopt-a-River Project which assesses and monitors the health of river systems in South Africa. The aim of implementing the project in Nature's Valley is to educate and capacitate both school educators and learners with the necessary skills, understanding and passion to monitor the ecological health of nearby river and wetland systems; instil in the learners (and through them their community) an understanding of the importance of water and the urgent need for its conservation and sustainable use and ultimately ensure future availability of safe drinking water for all community members. ⁶⁷	Nature's Valley Trust
Coastal Clean-up Day	Annual clean-up of the local rivers and wetlands linked with the coastal clean-up day promoted by Eden District Municipality. ⁶³	Nature's Valley Trust
Fishing Club	Educational and awareness raising project currently being implemented within the local communities living in and around the Nature's Valley Area. Community members are taught sustainable fishing practices and encouraged to utilise the wetland, river and estuary areas with care. ⁶³	Nature's Valley Trust

Communication, education and public awareness (CEPA) play an essential role in gaining the cooperation and collaboration of individuals and organizations in the public, political and economic sectors to act to reduce wetland loss and degradation. This section

details the current activities that both Eden District Municipality engages in for raising awareness and educating the community at large as well as the work of some of the local municipalities and NGOs.

7.1 COMMUNICATION AND EDUCATION

The Southern Cape Wetlands Forum (SCWF), in conjunction with Eden District Municipality and SANParks, provides intensive wetlands education paired with field-trip based restoration to local communities living within the municipality. The education session portion of the day entails interactive sessions on what wetlands are and why they are valuable to the community. The value and importance of biodiversity is also emphasised. Following this, with the physical assistance of the local community, a wetland within the immediate vicinity is visited and learners are taught about and how to restore habitat and conserve the wetland area. Following the education day, Eden District Municipality actively engages in cleaning up and restoring the same wetland with follow up conservation work. In this way the community benefits not just from wetland education but the enhanced ecosystem services provided from the restored wetland area as well as increased knowledge capacity on how to protect and conserve wetlands.⁶⁸

Eden District Municipality has also hosted several World Wetlands Day (WWD) Events in the past where the mini Stream Assessment Scoring System (SASS) tools are taught to school children. The most recent WWD event was held in February 2016 in conjunction with Laerskool Touwsrante at the Ebb and Flow rest camp in Garden Route National Park, Wilderness Section. At the event, which was themed “Wetlands Day – For Our Future”, Mr Vernon Gibbs-Halls of Eden District Municipality, presented and taught pupils on the importance and value of wetlands. A wildlife show was also presented by the Lunchbox Theatre Group. The creative and dynamic Lunchbox Team used their theatre style presentation to educate and entertain learners through important biodiversity messages. The school children were then shown how to recreationally engage with a local wetland in the area.⁶⁴

In addition to the valuable environmental and wetland education work being undertaken by Eden District



FIGURE 39: Eden District Municipality World Wetlands Day Event at Ebb and Flow in Wilderness, February 2016.⁶⁹

7.1 COMMUNICATION AND EDUCATION *(continued)*

Municipality itself, other wetland education days are also being implemented on a smaller scale. Each year, Knysna Local Municipality holds a World Wetlands Day Event in local schools and educates pupils on the value of wetlands in the local environment as well as on the mini SASS tools.⁷⁰ Bitou Local Municipality engages in active wetland and environmental education throughout the year through the placing of informative signboards at key environmental areas.⁷¹ Through the use of pictures, the sign boards detail what the habitat is, what are the key flora and fauna living in that habitat and also details some of the threats.

Nature's Valley Trust (NVT), a small NGO operating in the Nature's Valley area is also involved in active community education. The conservation education staff involved in NVT use curriculum based initiatives to reach over 5000 community members each year thereby equipping them to understand why conservation should be an integral part of how they live their lives. The CE program uses 17 specially designed, curriculum integrated outdoor classrooms where children have access to hands-on experiences with nature. One of the education initiatives in particular (the Adopt-A-River Programme) focuses on the importance of local rivers and wetlands for local livelihoods.⁷²

7.2. PUBLIC PARTICIPATION AND AWARENESS

Strategic documents such as the IDP, SDF, Coastal Management Programme and EMF are reviewed and updated regularly. Formal public participation processes are followed whenever these documents are updated to ensure that the public has ample opportunity to submit comments and engage with the municipality. Eden District Municipality is also responsible for commenting on all Environmental Impact Assessment (EIA) applications, the process of which requires two rounds of public participation,

before a decision is made by either DEA&DP or the National DEA.⁶⁴

In addition to this, Eden District Municipality engages with local rate-payers associations as well as conservancies on a continuous basis and have also funded the Bitou Wetlands Project which is a social upliftment programme.⁶⁴



FIGURE 40: Presenting of funds to the Bitou Wetland Project by Eden District Municipality.⁶⁵

CONCLUSION

The aim of the Wetland Report was to bring together all the available wetland related information for the municipality as well as highlight gaps where wetland management within the municipality could be strengthened going forward.

Through an extensive desktop study, as well as multiple bi-lateral meetings with stakeholders working throughout Eden District Municipality, it was found that the district has a huge wealth of wetlands including one RAMSAR site. The wetlands within the municipality not only provide a wide range of ecosystem services but also provide key habitat for a number of rare and critically endangered flora and fauna. They also play a pivotal role in reducing the impacts of climate change as well as in disaster risk management within the district. The wetlands within the district however, are currently under major threat as a result of human activities. Losing wetlands within the district, puts the municipality at risk from losing the valuable ecosystem services these systems provide.

In terms of wetland management, based on the information available at the time, it was found that currently there is no specific dedicated department within Eden District Municipality which directly deals specifically with the management of wetlands within the landscape. Instead, the management of wetlands is a collective but disconnected effort between the various departments of Eden District Municipality, the six local municipalities within Eden District Municipality, parastatals such as CapeNature and SANParks and private stakeholders, all of whom manage wetlands according to different mandates. It was also found that different stakeholders are responsible for different sections of land and that the district and local municipalities currently work from separate IDPs with different goals. As a result of all this, management of wetlands is extremely fragmented across Eden District Municipality and is not holistic or consistent. This puts wetlands at risk from degradation (whether deliberate or accidental) as well as from total loss.

It was also found that other than the SANBI NFEPA data, there is currently no formal ground-truthed wetland map for the district, clearly depicting where the wetlands are located within the landscape. This significant gap in mapping makes development planning around wetlands extremely challenging. As such, there is a real need for comprehensive ground-truthed mapping, which not only highlights where wetlands are on the ground but also indicates their status (i.e. pristine condition or degraded), to be undertaken within the municipality to assist town planners and farmers with future planning of developments and farm expansion/ redevelopment.

Finally, it was found that there is also no formal wetland information database monitoring the shifting status of wetlands within Eden District Municipality. As such, wetlands are at risk from being degraded or even lost entirely due to lack of knowledge on their current location and status. The development of a ground-truthed map as mentioned above would assist with the initial identification of wetlands within the landscape and follow up monitoring would assist with subsequent status monitoring which could lead to their improved management.

Overall, in order to strengthen wetland management, prevent further loss of wetlands and ensure the continued provision of valuable ecosystem services to the municipality, a holistic and collaborative management approach is recommended. It would be useful if Eden District Municipality developed a wetland management guideline strategy which could then be adopted and utilised by all the local municipalities within the district. Utilising the forums such as the SCWF more effectively would facilitate better sharing of information, addressing of capacity constraints and allocation of tasks for identified wetland maintenance/rehabilitation actions going forward. It would also be useful to work more closely with key external stakeholders such as SANParks, CapeNature etc. to ensure cohesion between projects across the district.

DEFINITIONS

Biodiversity⁷⁴

The variability among living organisms from all sources, including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.

Climate Change⁷⁵

Climate change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Critically Biodiversity Areas⁷⁶

CBAs incorporate: (i) areas that need to be safeguarded in order to meet national biodiversity thresholds (ii) areas required to ensure the continued existence and functioning of species and ecosystems, including the delivery of ecosystem services; and/or (iii) important locations for biodiversity features or rare species.

Disaster⁷⁷

Disaster means a progressive or sudden, widespread or localised, natural or human-caused occurrence which is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Disaster Management⁷⁸

Disaster Management means the systematic process of using administrative directives, organisations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster. This term is an extension of the more general term 'Risk Management' to address the specific issue of disaster risks. Disaster Management aims to avoid, lessen or transfer the adverse effects of hazards through activities and measures for prevention, mitigation and preparedness.

Ecological Support Areas⁷⁹

ESAs are supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. An ESA may be an ecological process area that connects and therefore sustains Critical Biodiversity Areas or a terrestrial feature, e.g. the riparian habitat surrounding and supporting aquatic Critical Biodiversity Areas.

Ecosystem services⁷⁹

This is the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth.

DEFINITIONS

Estuary⁸⁰

Means a body of surface water -

- (a) that is part of a water course that is permanently or periodically open to the sea;
- (b) in which a rise and fall of the water level as a result of the tides is measurable at spring tides when the water course is open to the sea; or
- (c) in respect of which the salinity is measurably higher as a result of the influence of the sea.

Flood⁸¹

A flood is defined as the temporary inundation of normally dry land areas resulting from the overflowing of the natural or artificial confines of a river or other body of water, including groundwater.

Flash Flood⁷⁷

Flash floods are caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through river beds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or ice jam. The basic cause of most river floods is excessive rainfall which causes significant elevations in river levels. The effect of elevated water levels is the inundation of low lying river floodplain areas.

Invasive Species⁷⁹

Means species that have been introduced into an area, and are able to outcompete and displace indigenous or useful alien species.

Ramsar Site⁸²

Ramsar Sites are designated because they meet the Criteria for identifying Wetlands of International Importance. The first criterion refers to Sites containing representative, rare or unique wetland types, and the other eight cover Sites of international importance for conserving biological diversity. These criteria emphasize the importance the Convention places on sustaining biodiversity.

Wetland⁸³

Land which is transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

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ANNEXURES

ANNEXURE 1 SPATIAL DEVELOPMENT MAPS WITH WETLAND OVERLAYS FROM THE BITOU SDF

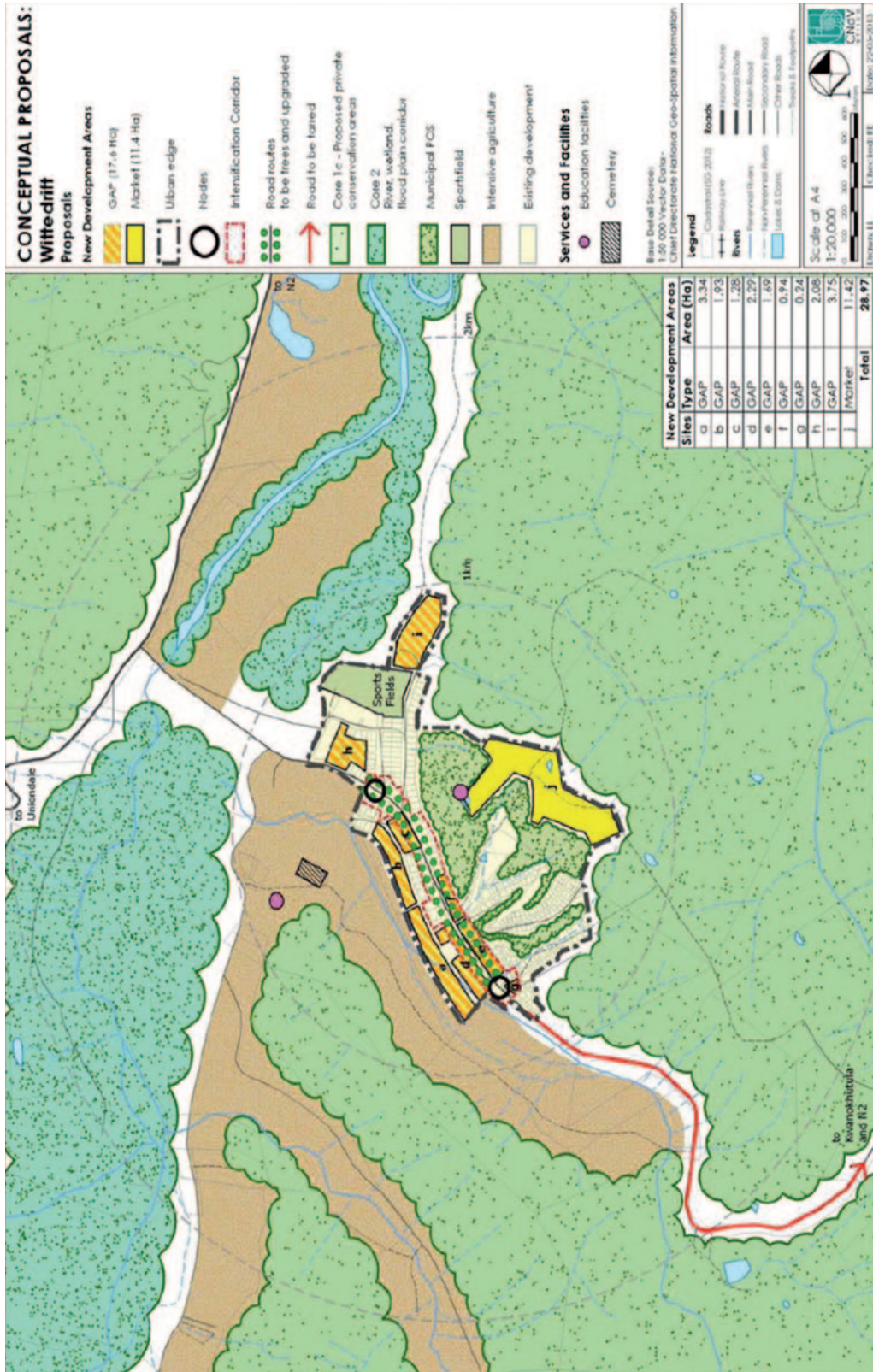


ANNEXURE 1 SPATIAL DEVELOPMENT MAPS WITH WETLAND OVERLAYS FROM THE BITOU SDF *continued*



ANNEXURES

ANNEXURE 1 SPATIAL DEVELOPMENT MAPS WITH WETLAND OVERLAYS FROM THE BITOU SDF *continued*



ANNEXURES

ANNEXURE 2 BITOU VALLEY WETLAND MAP



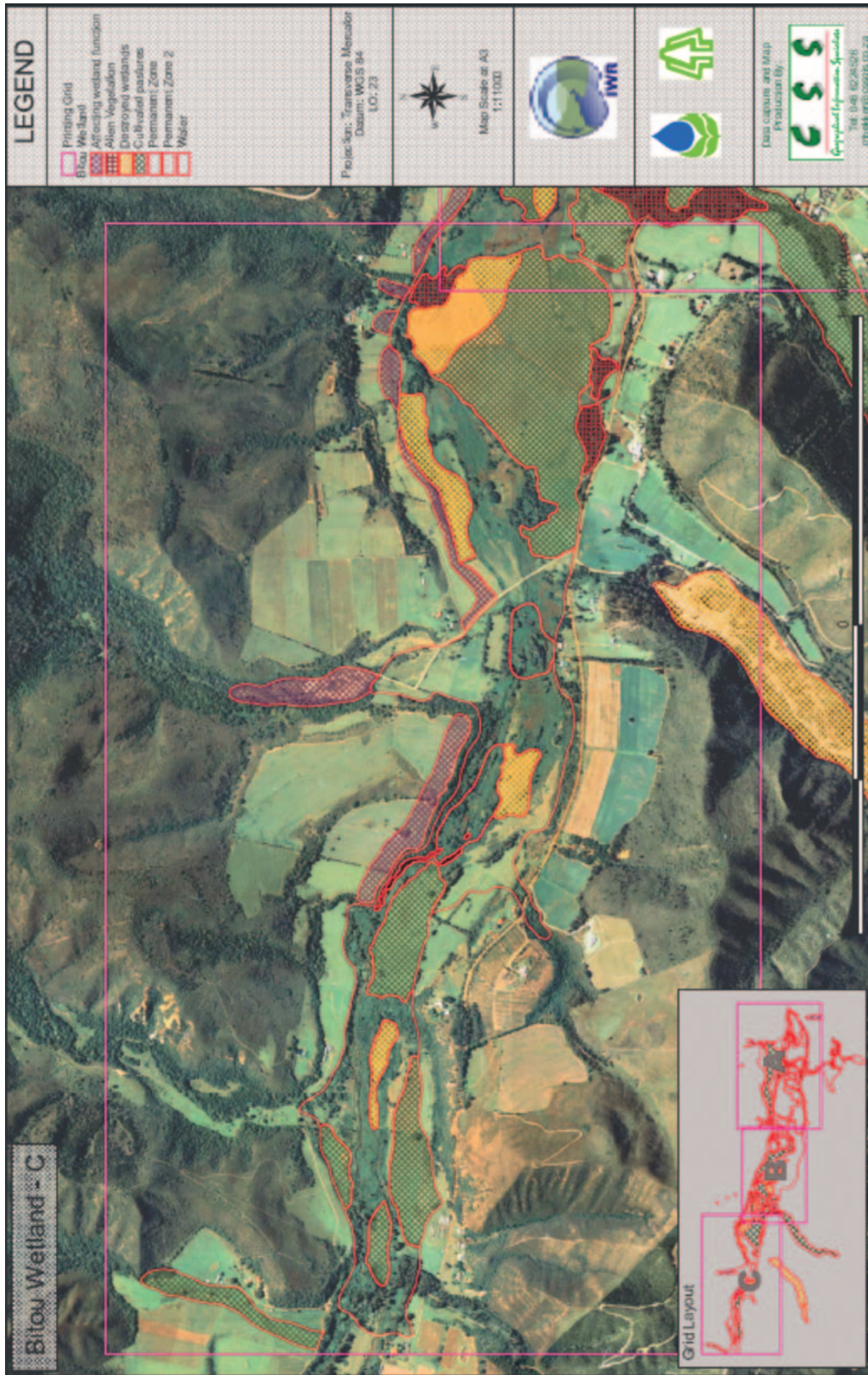
ANNEXURES

ANNEXURE 2 BITOU VALLEY WETLAND MAP *continued*



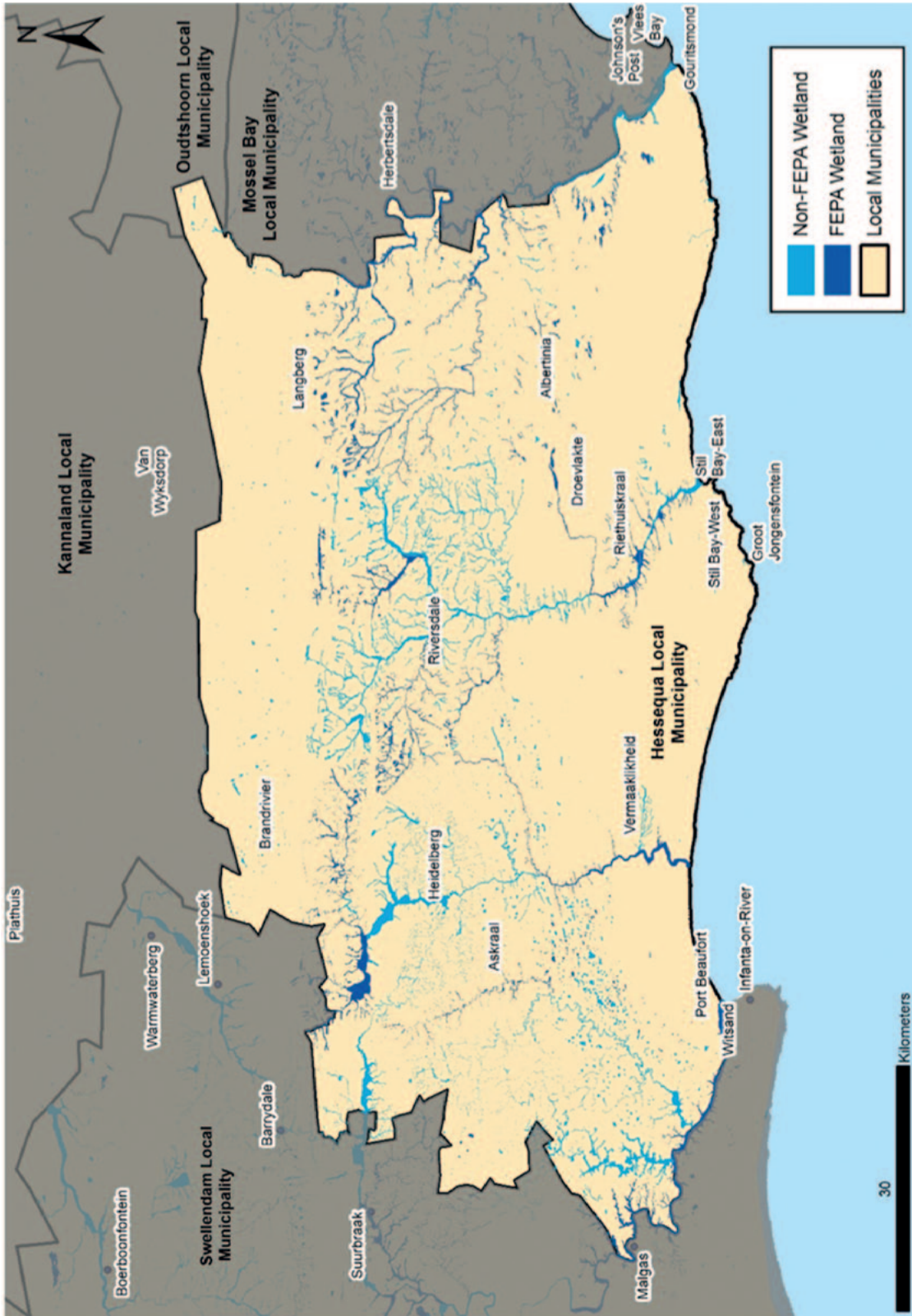
ANNEXURES

ANNEXURE 2 BITOU VALLEY WETLAND MAP *continued*



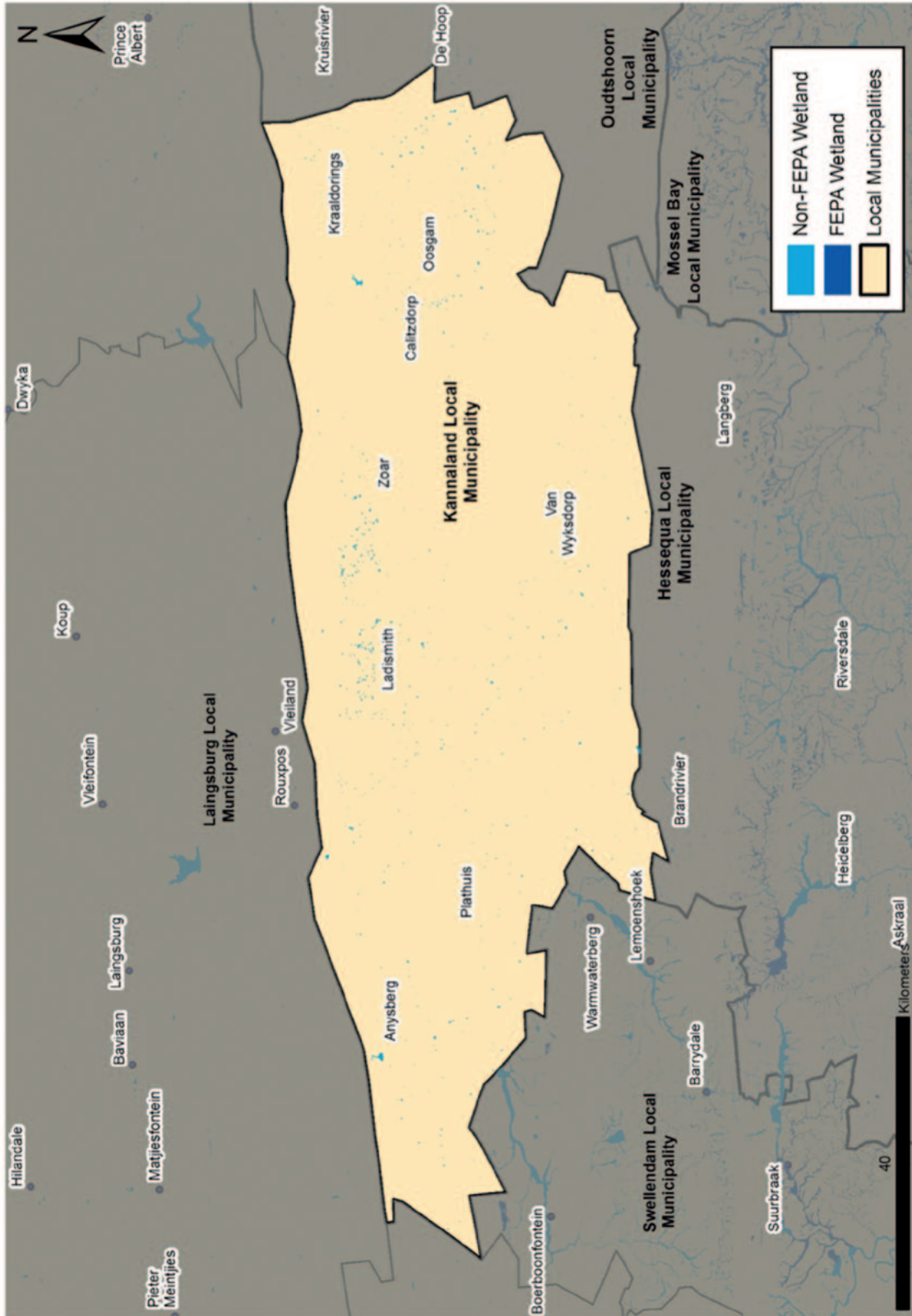
ANNEXURES

ANNEXURE 3 MAPS INDICATING THE NFEPA WETLANDS WITHIN EDEN DISTRICT MUNICIPALITY



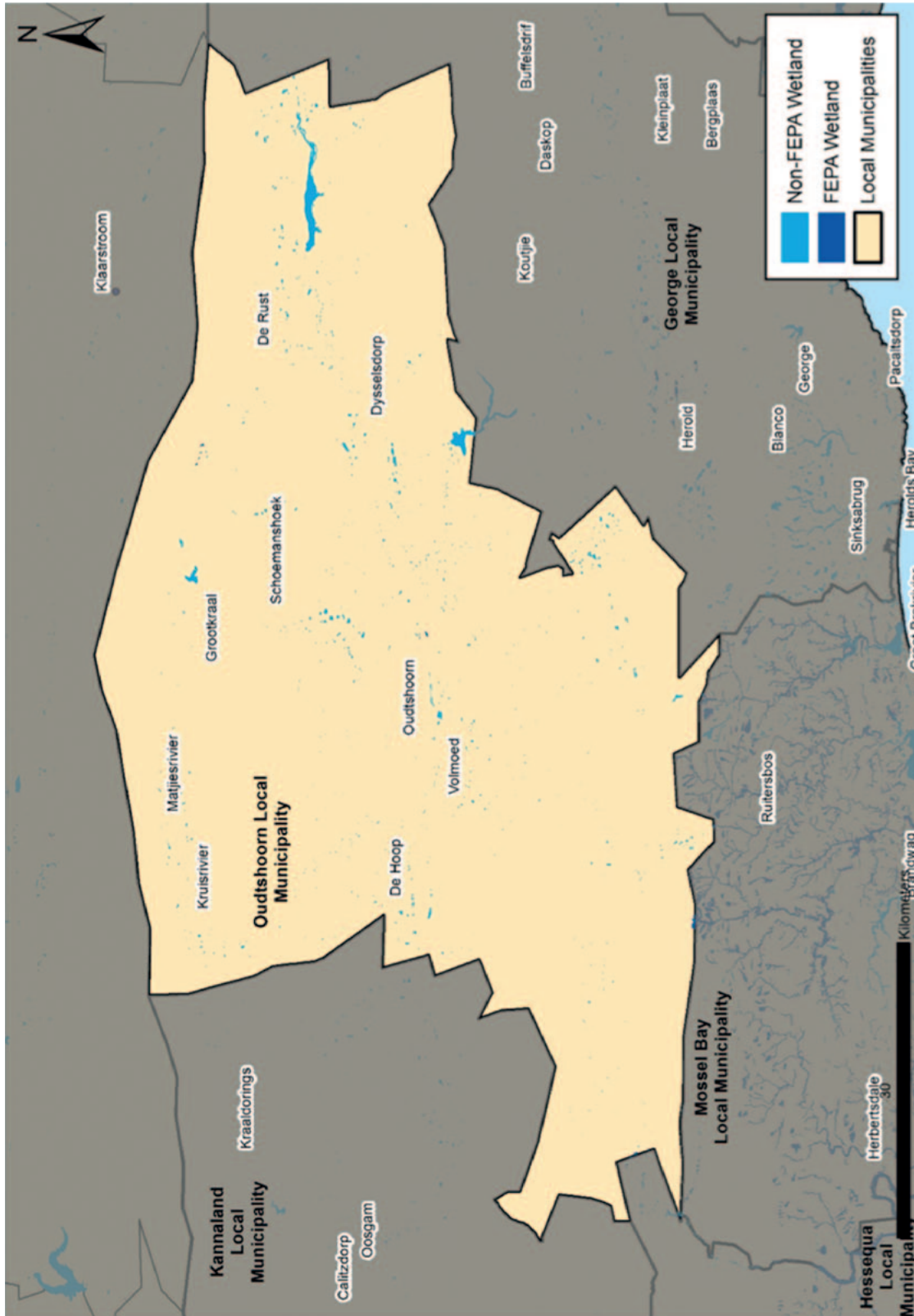
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ANNEXURE 3 MAPS INDICATING THE NFEPa WETLANDS WITHIN EDEN DISTRICT MUNICIPALITY *continued*



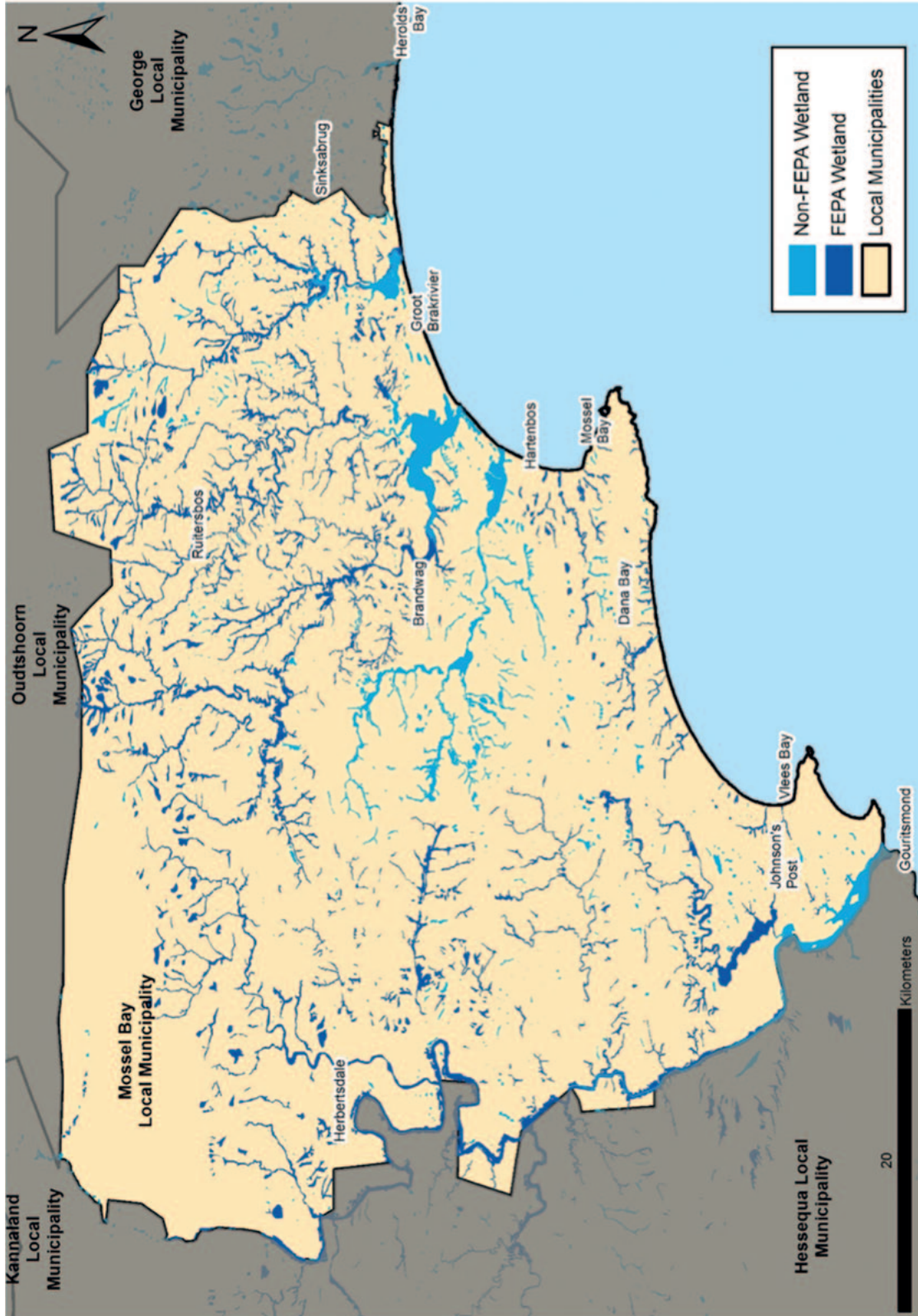
ANNEXURES

ANNEXURE 3 MAPS INDICATING THE NFEPA WETLANDS WITHIN EDEN DISTRICT MUNICIPALITY *continued*



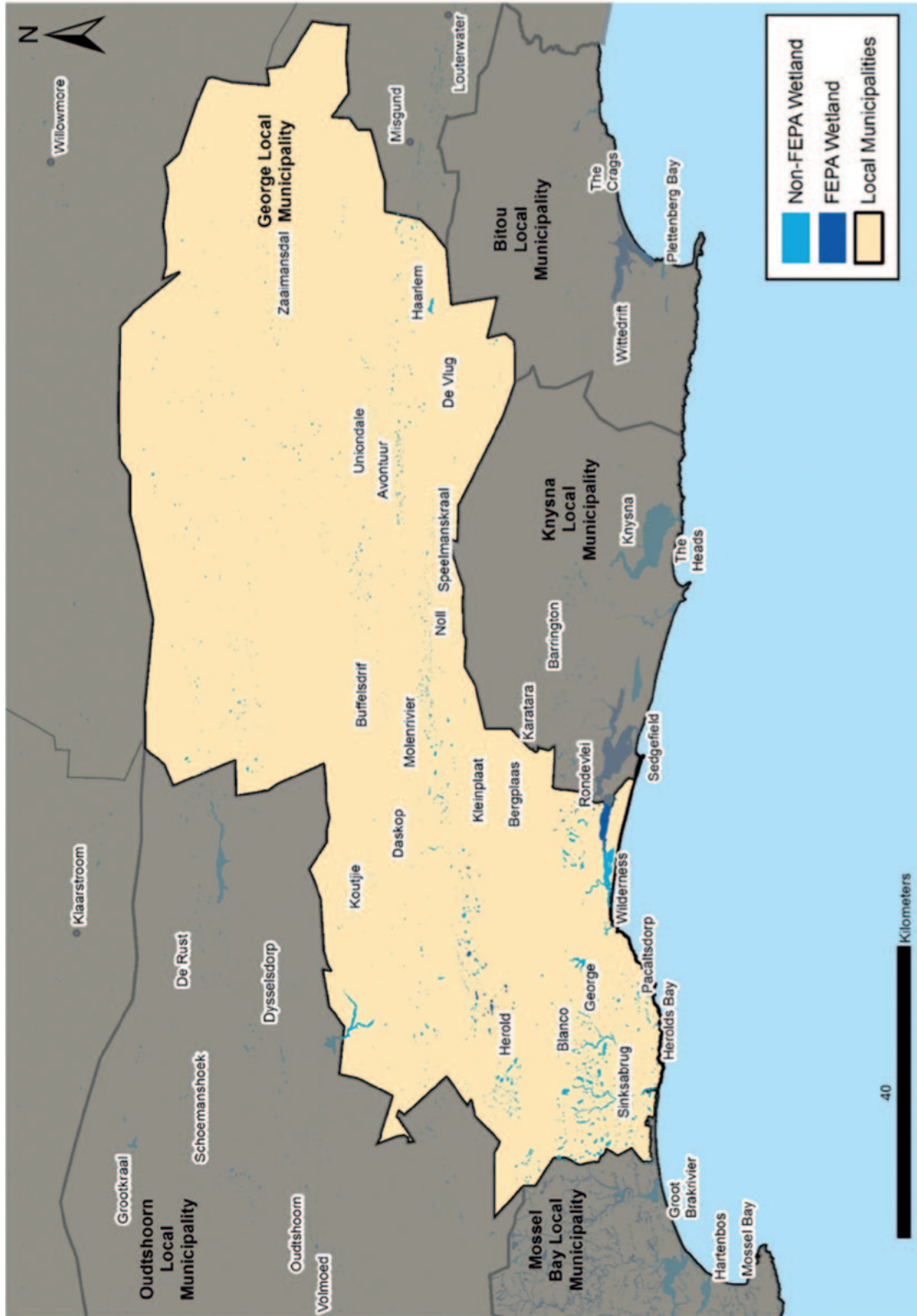
ANNEXURES

ANNEXURE 3 MAPS INDICATING THE NFEPA WETLANDS WITHIN EDEN DISTRICT MUNICIPALITY *continued*



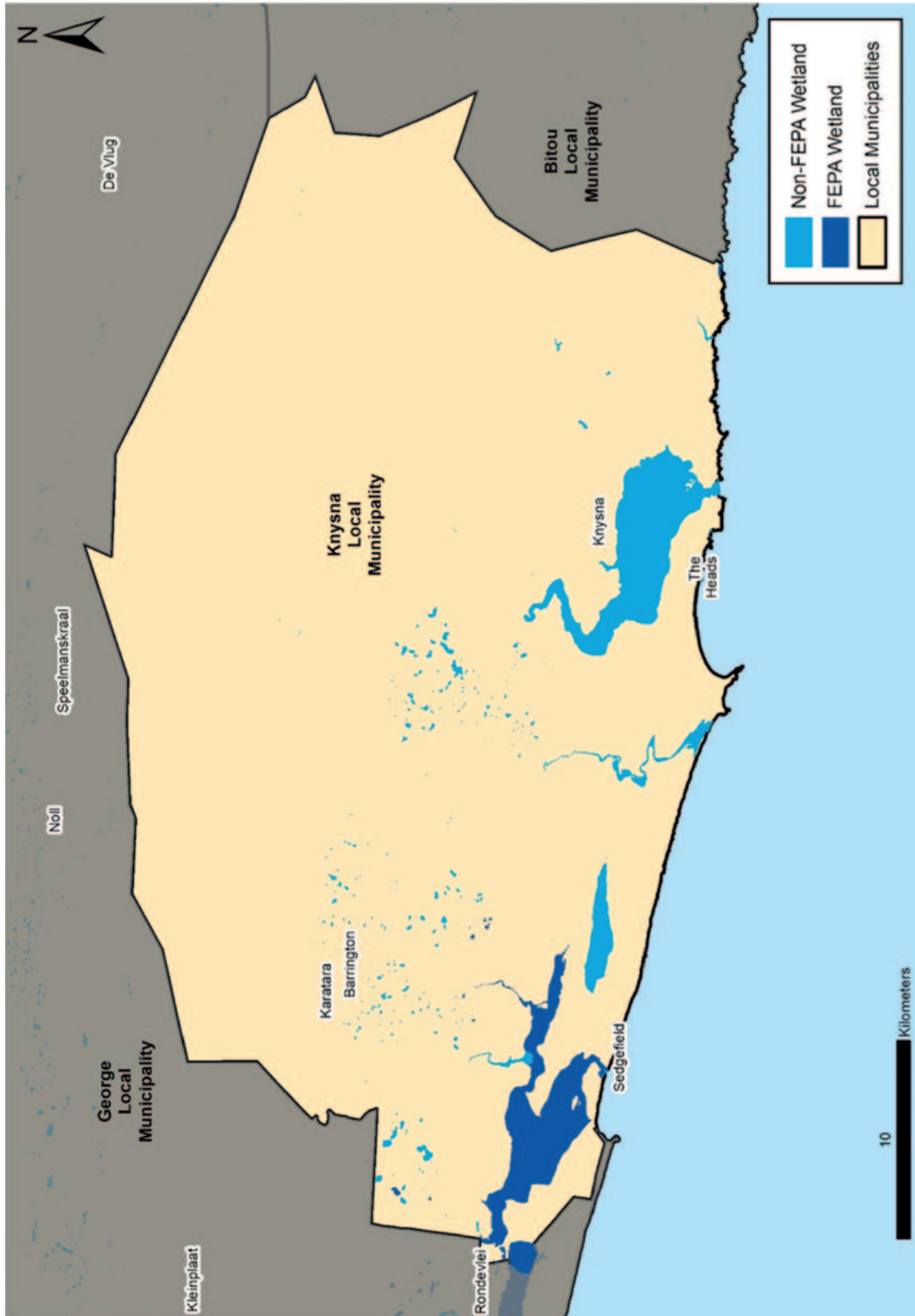
ANNEXURES

ANNEXURE 3 MAPS INDICATING THE NFEPA WETLANDS WITHIN EDEN DISTRICT MUNICIPALITY *continued*



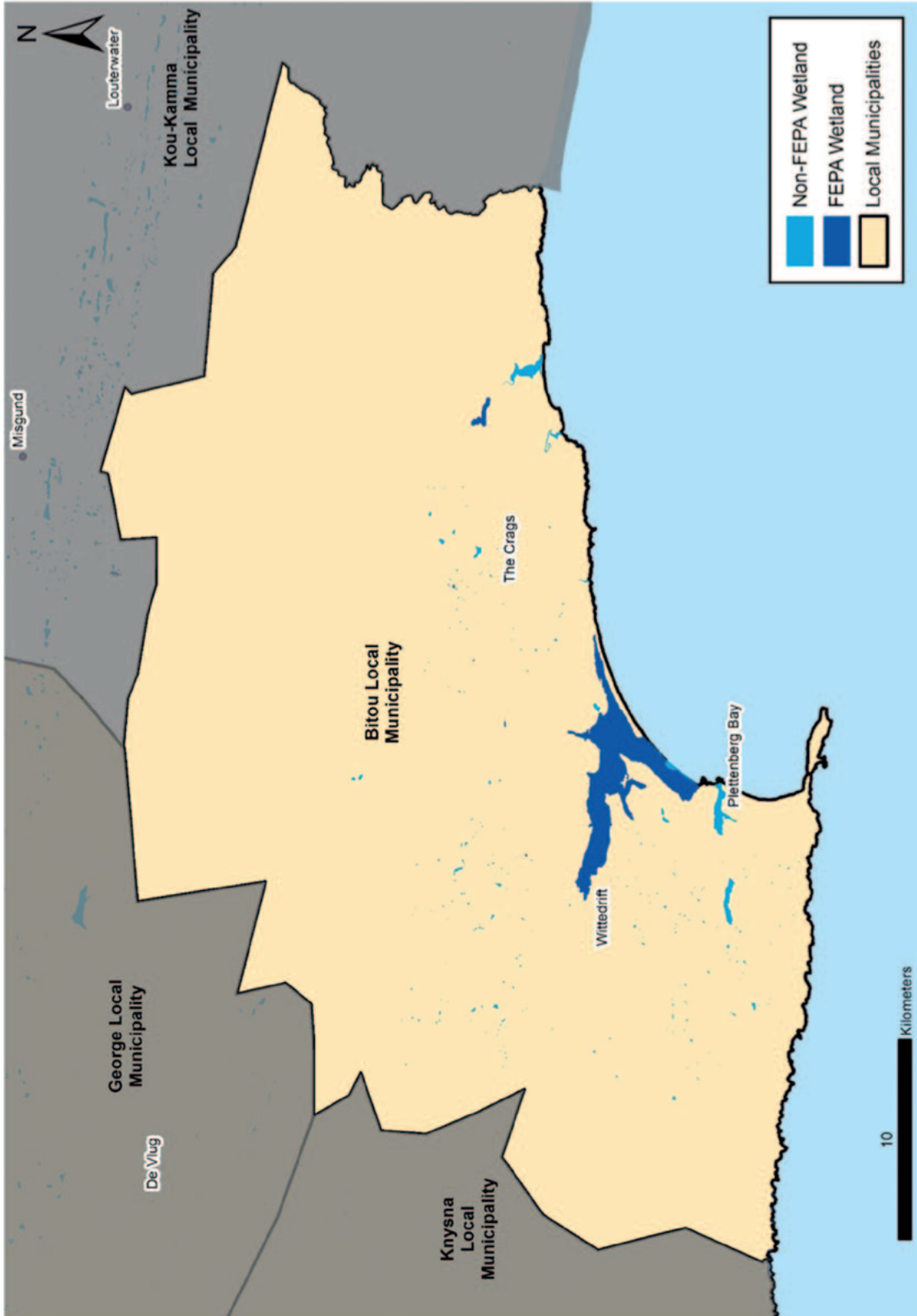
ANNEXURES

ANNEXURE 3 MAPS INDICATING THE NFEPA WETLANDS WITHIN EDEN DISTRICT MUNICIPALITY *continued*



ANNEXURES

ANNEXURE 3 MAPS INDICATING THE NFEPA WETLANDS WITHIN EDEN DISTRICT MUNICIPALITY *continued*







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