

ESTUARINE MANAGEMENT PLAN FOR THE IKONGENI ESTUARY

RAY NKONYENI MUNICIPALITY

KWAZULU-NATAL PROVINCE
ECONOMIC DEVELOPMENT, TOURISM AND ENVIRONMENTAL AFFAIRS
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EXECUTIVE SUMMARY

Introduction

Estuaries are recognised as particularly sensitive and dynamic ecosystems, and therefore require above-average care in the planning and control of activities related to their use and management. For this reason, the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008, as amended by Act 36 of 2014) (ICMA), via the prescriptions of the updated 2021 National Estuarine Management Protocol (NEMP) (DEA, 2013; DEFF, 2021), require Estuary Management Plans (EMPs) to be prepared for all estuaries in order to create informed platforms for efficient and coordinated estuarine management. In light of this, the KZN Department of Economic Development, Tourism and Environmental Affairs (EDTEA) prioritised the development of an EMP for the iKongeni estuary, the purpose of which is to provide the overarching Vision for the future desired state of the estuary, and thereby guide the management of the human activities in and around this system by setting out essential management objectives and related actions/activities.

This EMP applies to the Estuarine Functional Zone (EFZ) of the iKongeni estuary, that is, the area below the 10 m topographical contour, which encapsulates the flood plain, a range of estuarine habitats, and variable estuarine processes and functions, such as backflooding.

Summary of Situation Assessment

The Situation Assessment Report, or status quo assessment, locates the iKongeni estuary within the Ray Nkonyeni Municipality while delineating the boundaries of the estuarine system as well as a description of the broader catchment, including the catchments geology, climate, runoff, and land-use. The current status of the estuary is then described through an assessment of the ecological characteristics and functioning of the system, its health status and importance and the ecological goods and services it provides. Thereafter the broader socio-economic context of the region and the social uses and activities that it supports are described. Current and potential impacts and/or impacting activities or threats to the ecological functioning of the system are described prior to unpacking the legal instruments and related strategies and plans which govern the management of the estuary, along with the current institutional structures governing estuarine management.

The Situation Assessment Report concludes by detailing opportunities and constraints which should be used to develop the necessary responses or actions, and by making recommendations to address identified information gaps.

Vision and Management Objectives

The vision for the iKongeni estuary is as follows:

The iKongeni estuary, a highly transformed urban system, remains a key tourism and economic asset for the Ray Nkonyeni Municipality, and is managed sustainably as a functioning, healthy and attractive ecosystem for the benefit of all

Management Objectives and Activities

A comprehensive list of proposed management objectives for the iKongeni estuary was compiled using the critical issues identified as part of the scoping phase, including inputs received during public participation, and the SWOT analysis. These management objectives are grouped into categories of specific issues. The ecological and socio-economic consequences of 'no action', expected availability of resources, cost and expected duration are included and

aid in the selection of management priorities for the 5-year cycle of this EMP.

Spatial Zonation

Spatial zonation of activities within an EFZ is necessary to avoid user conflict and to guide sustainable utilization without degradation of the estuarine environment. It also allows for the spatial representation of the desired state and the aims of the management objectives, where applicable, and is informed by (DEA, 2015) the geographical boundary of the estuary also indicating important habitats (e.g., floodplain, open water, reed beds, sandflats, etc.); the surrounding land uses and existing infrastructure (RNM Town Planning Scheme, 2014); areas designated for the conservation and protection of biodiversity; appropriate buffers in which land use and development are strictly controlled and monitored; and zones where certain types of activities (recreational, commercial, industrial, harvesting etc.) are permissible and others not permissible. The spatial zonation applicable to the iKongeni EMP includes legislated development buffer zones, a Habitat Protection Zone, a Low Impact Recreation Zone and a High Impact Recreation Zone.

- **Remainder of the Estuarine Functional Zone (Urban Zone)** - the iKongeni estuary is an urban system with urban development almost fully transforming the EFZ. It is impacted upon negatively by human activities and in turn impacts, both negatively and positively, on neighbouring developments. This zone takes existing land use, existing zonation as well as existing land use controls into consideration;
- **Habitat Protection Zone -** Despite its highly modified and heavily urbanised state, the iKongeni estuary still supports *Phragmites* reed beds, swamp forest habitat and coastal dune and riparian forest, which provide valuable natural coastal habitat. These habitats need to be protected with conditions of use included;
- **Low Impact Recreational Zone** - Low impact recreational use is permitted within the estuary water body but not beyond the pedestrian bridge. A 3- 5 m wide set-back (buffer) from the estuary shoreline minimises human disturbance to marginal estuarine habitats and is a no-go zone for other activities (e.g., disposal of garden refuse, erecting of signage, instalment of rubbish bins). Permissible activities as well as conditions of use for this zone are detailed and a general Code of Conduct in respect to different low impact uses to be applied; and
- **High Impact Recreation Zone** - This area includes the sand berm of the iKongeni estuary south of Club Zuri, which forms part of Margate Main Beach. It should be well managed particularly during peak holiday seasons when tourism and recreational activities are highest.

Priority rehabilitation of the iKongeni estuary relates predominantly to curtailing sewage spills and surcharges within the system, however, other activities/areas for rehabilitation are detailed and include: removal of accumulated litter and dumped solid waste; invasive alien vegetation removal; rehabilitation of areas previously damaged by flooding, vulnerable to erosion and/or where inappropriate defence interventions have been implemented; rehabilitation of the estuarine margin and dune cordon; and reinstate a vegetated riparian corridor above the road bridge.

Institutional Capacity and Arrangements

The NEMP identifies the RNM as the RMA currently legally accountable for the development of EMPs within its area of jurisdiction, as well as being responsible for the co-ordination of their implementation. Currently the Municipality does not have the capacity, resources (human and financial) or knowledge necessary to fulfil their coastal and estuarine management role and that management actions occur on a reactionary basis when the need arises and are often uncoordinated and addressed using only available human and financial resources. The long -term appointment of an estuarine management co-ordinator (EMC) is recommended, however, in the short terms this co-ordinating role should be undertaken by the Ugu DM. Regardless of where this individual is located, they will play a critical co-ordinating role for all other implementing agencies and RNM departments.

The key to successful implementation of this EMP is the commitment and contribution of all spheres of government to the process. Specific management actions are identified and remain the responsibility of mandated government agencies. Both co-management and effective governance have already been identified as the keystones to the efficient and effective management of estuaries within the RNM Area, as such numerous structures/forums are identified. Effective implementation of this EMP requires the conversion of the priority actions into detailed project plans, which must be prepared and adopted into the respective departmental implementation strategies.

Management Priorities

A full range of priority management actions have been identified to facilitate the achievement of the management objectives. These include the specific management priorities; actions required to achieve them; related legal basis for the specific priority actions; performance indicators against which to measure implementation or effectiveness of the actions; and a work plan identifying the actions priority and the responsible agent or institution. These management priorities are summarised below.

	Category	Key Objective	Management Priorities	Select Indicators	Priority
1	Estuarine health and functioning	The ecological health and natural functioning of the iKongeni estuary is improved and safeguarded	• Secure adequate quantity and quality of freshwater input to improve and maintain ecosystem health and functioning by specifically preventing sewage inflows • Minimise other forms of pollution by identifying and addressing activities that lead to poor water quality • Rehabilitate degraded areas • Ensure effective mouth management that enables maximum tourism benefits while maintaining adequate estuarine functioning	• Ecological health of estuaries is improved with sewage inflows prevented and water quality improved • Estuarine habitat is regained and restored • The mouth is effectively managed	**High**
2	Conservation	The remaining biodiversity and estuarine habitats of the iKongeni estuary are conserved	• Ensure the conservation of remaining estuarine habitats • Control the spread and densification of both aquatic and terrestrial invasive alien plant species • Ensure sustainable resource use through an effective level of compliance management	• Estuarine habitat is regained and restored • Invasive Alien Plants are controlled • Resources are sustainably utilised	**High/ Medium**
3	Land-use and Infrastructure Planning and Development	All developments and proposed changes in land-use, including infrastructure, which impacts or could impact on the iKongeni estuary, are assessed and	• Ensure effective implementation of this EMP • Minimise the potential impacts of climate change • Facilitate and manage the sustainable utilisation and development of the areas within the Estuarine Functional Zone	• Effective implementation of EMP ensured • Impacts of climate change are minimised • All development and land use changes surrounding and within the EFZ comply with environmental legislation and	**High/ Medium**

		regulated		environmental best practice / risk aversion approach	
4	Institutional and Management Structures	Effective management and co-operative governance of the iKongeni estuary	• Ensure effective co-ordination of estuarine management responsibilities • Define co-operative governance arrangements for the iKongeni estuary • Secure financing for estuarine management initiatives	• Estuarine management co-ordination function undertaken by Ugu DM until recommended estuarine management co-ordinator appointed • Estuarine bylaws are drafted (or environmental bylaws updated) • Ugu estuary sub-committee of the Ugu MCC established (Regional Estuary Advisory Forum) and ongoing meetings held	**High**
5	Socio-economic considerations	Socio-economic benefits are enhanced and regulated to ensure sustainable resource use	• Maintain safe, clean, equitable and controlled access • Regulate recreational use in and around the iKongeni estuary • Maximise economic benefits	• Safe, clean and equitable access maintained. • Recreational use regulated. • Economic opportunities maximised.	**Medium**
6	Education, awareness, monitoring and research	The value and importance of the iKongeni estuary is well understood and made known to members of society	• Improve levels of public awareness and appreciation of the value of the iKongeni estuary • Enhance the knowledge and understanding of the iKongeni estuary through monitoring	• Signage erected; information disseminated; awareness increased. • Knowledge and understanding enhanced through monitoring	**Medium**

Integrated Monitoring Plan

According to the standards for estuarine management, management actions should be based on evidence. Thus, monitoring is a crucial aspect of the adaptive estuarine management planning process as the generated data will be used to inform and update management decisions. However, the collection, processing and interpretation of such data, particularly ecological data, are generally costly and time-consuming and often require considerable scientific expertise. In the context of estuarine management, there are three broad categories of monitoring which should be incorporated into an integrated monitoring plan, namely Resource Monitoring, Compliance Monitoring and Performance Monitoring (DEA, 2015).

Research Requirements

Despite the highly degraded state of the iKongeni estuary, at a local level it is critically important in terms of tourism that it maintains some ecological value as a coastal habitat in an otherwise urban environment. Physical, chemical and biological information on the iKongeni estuary is either scarce or the available data is significantly outdated. More recent data generation is generally piece-meal or undertaken at a desktop level corroborated by expert input (DWA, 2013; DWS, 2015b; Van Niekerk, Adams, Lamberth, MacKay, *et al.*, 2019). Specific recommendations with the view of preventing further degradation of the iKongeni estuary are included in the EMP.

Concluding remarks

Through this EMP development process, it is unambiguously apparent that the iKongeni estuary has long history of human disturbance and interference which persists today. Within the highly transformed and urbanised landscape, what remains of the iKongeni system is frequently subjected to spills of domestic effluent, with negative ecological consequences and an increased need to artificial breach as well as negative socio-economic consequences due to potential human health risks and closure of Margate Main Beach thus affecting tourism. It is important to acknowledge that the iKongeni estuary does have important role to play at a regional level despite its degraded state, particularly in terms of socio-economic value, and ecological value in terms of coastal habitat provision in an otherwise highly urbanised environment. It is for these reasons that further deterioration of iKongeni estuary must be prevented through effective and co-ordinated management by the relevant institutions. It is not the estuary itself that needs to be managed, but rather human activities which continue to negatively affect the integrity of the estuary and the ecosystem goods and services it provides. It is absolutely imperative that the aged, failing and/or under capacitated sewage infrastructure receive urgent attention, that funding is prioritised and allocated accordingly, and that plans for upgrades and maintenance work are expedited. Overall, what is required is a change in mindset and the acknowledgement of that this neglected estuarine ecosystem as a valuable asset worthy of defence and upgrade, to the benefit of both the environment and coastal communities. In conclusion, **priority actions** requiring immediate attention are summarised as:

- Urgent relevant authorities' workshop to be convened to review and update the iKongeni estuary draft Mouth Management Plan, Maintenance Management Plan as well as the draft SOP in response to emergency incidents (including undertaking the required stakeholder engagement process);
- Planned upgrades to the Margate WWTW and sewerage infrastructure undertaken and implementation fast tracked;
- Reinstate and complete the outstanding WUL and CWDP application process and submit for authorisation;
- Erect/install applicable signage;
- Ensure the proposed RNM stormwater management master plan includes all aspects included in this EMP; and
- Establish Ugu District Coastal Committee, Estuaries sub-committee.

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LIST OF ACRONYMS

BSP	Biodiversity Spatial Plan	MMP	Mouth Management Plan
CBA	Critical Biodiversity Area	MPA	Marine Protected Area
cfu	Colony forming units	MPA	Marine Protected Area
CML	Coastal Management Line	NBA	National Biodiversity Assessment
CMP	Coastal Management Programme	NBA	National Biodiversity Assessment
CPI	Consumer Price Index	NEMA	National Environmental Management Act (No. 107 of 1998)
CVI	Coastal Vulnerability	NEMA	National Environmental Management Act (No. 107 of 1998)
DALR&RD	Department of Agriculture, Land Reform and Rural Development	NEMP	National Estuarine Management Protocol
DFFE	Department of Forestry, Fisheries and Environment	NGOs	Non-governmental Organisations
DM	District Municipality	NGOs	Non-governmental Organisations
DO	Dissolved Oxygen	PAHs	Polyaromatic Hydrocarbons
DWS	Department of Water and Sanitation	PAHs	Polyaromatic Hydrocarbons
EDC	Estuarine Dependence Category	PCC	Provincial Coastal Committee
EDTEA	KZN Department of Economic Development, Tourism and Environmental Affairs	PES	Present Ecological State
		PGDS	Provincial Growth and Development Strategy
EEW-EPRG	Estuary Early Warning - Emergency Preparedness and Response Guide	PSDF	Provincial Spatial Development Framework
		REC	Recommended Ecological State
EFZ	Estuarine Functional Zone	RMA	Responsible Management Authority
EHi	Estuarine Health Index	RNM	Ray Nkonyeni Municipality
EIA	Environmental Impact Assessment	RQO	Resource Quality Objective(s)
EMF	Environmental Management Framework	SAR	Situation Assessment Report
EMP	Estuarine Management Plan	SAWQG	South African Water Quality Guidelines
EMPr	Environmental Management Programme	SDF	Spatial Development Framework
EMZ	Environmental Management Zone	SoC	State of the Coast
ESA	Ecological Support Area	SWOT	Strengths, Weaknesses, Opportunities and Threats analysis
GDP	Gross Domestic Product	SZ	Special Zonation
HCM	Hibiscus Coast Municipality (now Ray Nkonyeni)	TDS	Total Dissolved Solids
ICMA	Integrated Coastal Management Act (No. 24 of 2008)	TEC	Target Ecological State
IDP	Integrated Development Plan	TPC	Threshold of Potential Concern
KPA	Key Performance Area	TWQR	Target Water Quality Range
KZN	KwaZulu-Natal	WftC	Working for the Coast
LED	Local Economic Development	WMA	Water Management Area
LM	Local Municipality	WSMP	Ugu Water Services Master Plan
MAR	Mean Annual Run-off	WWTW	Waste Water Treatment Works

DISCLAIMER, ASSUMPTIONS AND LIMITATIONS

This report has been prepared by Coastwise Consulting, with all reasonable skill, care and diligence within the terms of the contract with the KZN Department of Economic Development, Tourism and Environment Affairs (EDTEA) the Client. The findings in this report are based on the author/s' professional knowledge, data and resources available at the time and relevant information provided by the client. The nature of the study, and detail of assessment undertaken are dependent on the human and time resources committed to the study in agreement with the client prior to the assessment.

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1. INTRODUCTION

1.1. Background

The National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008, as amended 2014) (ICM Act), requires that estuaries within South Africa are managed in a co-ordinated and efficient manner, and in accordance with the updated National Estuarine Management Protocol of 2021 (DEA, 2013; DEFF, 2021) (NEMP) as well as the National Coastal Management Programme (CMP), which lays out specific objectives for management of the South African coastline, including estuaries. The identified vehicle to manage estuaries is the Estuarine Management Plan (EMP).

In light of the above directive and the KwaZulu-Natal CMP, EDTEA prioritised the development of an EMP for the iKongeni estuary.

1.2. Purpose of the Estuarine Management Plan

This report constitutes the second objective and core component of the estuarine management planning process, namely the EMP. The purpose of this component is to provide the overarching Vision for the future desired state of the estuary, and thereby guide the management of human activities in and around this system by setting out essential management objectives and related actions/activities.

The estuarine management process is by definition inclusive of coastal hinterland and marine influences, shoreline status, catchment management, human development impacts such as tourism, recreation and agriculture, and climate change, amongst many others. It is the primary document for use by the identified responsible management authority (RMA) to facilitate coordination of the management interventions identified during the planning process to ultimately ensure the longevity of the estuarine system. This is also the critical reference document for the incorporation of estuarine management into the municipal Integrated Development Planning (IDP) process as well as relevant national and provincial plans.

1.3. Document Structure

The structure of this EMP is detailed as follows:

- Section 2 provides a Summary of the Situation Assessment Report (SAR) (Breetzke, Meyer and Kinvig, 2020) – thereby providing context to the Vision, key Objectives and Management Objectives and Management Priorities;
- Section 3 sets out the Vision and Key Objectives for the management of the iKongeni estuary. It describes the desired future state at the end of the five-year period and provides the overarching logical framework for the action plans developed;
- Section 4 sets out the Management Objectives for the management of the iKongeni estuary and includes a list- of actions from which management priorities are selected;
- Section 5 provides a description of the various components and zones included in the Spatial Zonation of the iKongeni estuary;
- Section 6 describes the recommended Management Priorities, i.e., the required actions and activities to be undertaken in terms of implementing the EMP, captured as individual action plans;

- Section 7 sets out the Integrated Monitoring Plan required in respect to monitoring the biophysical components of the estuary, monitoring compliance, as well as assessing the performance of the EMP in respect to achieving the stipulated objectives;
- Section 8 describes the institutional arrangements for Implementation of the EMP, in respect to the key role players and participating institutions, and the recommended projects provided for in the action plans; and
- Sections 9 and 10 provide the recommendations for addressing specific shortfalls or knowledge gaps in the EMP, and the conclusion to the document, respectively.





2. GEOGRAPHICAL BOUNDARIES

The geographical boundaries of the iKongeni estuary, as per the EIA Regulations, are as detailed in Table 1 and illustrated in Figure 1.

Table 1: Geographical boundaries of the iKongeni estuary

Downstream Boundary	30°51'41.28"S, 30°22'21.84"E (estuary mouth)
Upstream boundary	30°51'13.30"S, 30°22'10.63"E
Lateral boundaries	10m contour Above Mean Sea Level (AMSL) along each bank



Figure 1: Delineation of the iKongeni estuary illustrating the EFZ based on the 10 m contour, and the 5 m contour

3. SUMMARY OF SITUATION ASSESSMENT

Overview

The National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008, as amended 2014) requires that estuaries within South Africa are managed in a co-ordinated and efficient manner, and in accordance with the National Estuarine Management Protocol via the development of an Estuarine Management Plan. The first phase in the process of developing an Estuarine Management Plan is an assessment of the status quo via a Situation Assessment, which explores and contextualises the iKongeni estuary, a small temporary closed system located in the located in the well-known coastal holiday town of Margate in the Ray Nkonyeni Municipality on the KwaZulu-Natal south coast, relative to various environmental, social and economic aspects. The key findings of this assessment, rather than an elaborate summary of the report, are captured below in order to both prepare for the management planning process.

The Situation Assessment Report locates the iKongeni estuary within the Ray Nkonyeni Municipality while delineating the boundaries of the estuarine system as well as a description of the broader catchment, including the catchments geology, climate, runoff, and land-use. The current status of the estuary is then described through an assessment of the ecological characteristics and functioning of the system, its health status and importance and the ecological goods and services it provides. Thereafter the broader socio-economic context of the region and the social uses and activities that it supports are described. Current and potential impacts and/or impacting activities or threats to the ecological functioning of the system are described prior to unpacking the legal instruments and related strategies and plans which govern the management of the estuary, along with the current institutional structures governing estuarine management.

The Situation Assessment Report concludes by detailing opportunities and constraints, which should be used to develop the necessary responses or actions, and by making recommendations to address identified information gaps.

Present Ecological State, as well as Desired Ecological State

Early assessments of the health of the iKongeni estuary (Heydorn, 1986, Whitfield 2000 and 2013) acknowledge its heavily urbanised catchment and highly degraded state and rated the overall condition of the system as 'Poor'. In 2015, the status of the iKongeni estuary was reassessed in greater detail through the estuaries Ecological Water Requirement study, a component of the Water Resources Classification Study for the Mvoti -Umzimkulu Water Management Area (DWS, 2015a). In this study, the health state of the estuary was downgraded to a Category D/E, i.e. highly degraded/ severely modified (DWS, 2015a). The 2018 National Biodiversity Assessment (Van Niekerk, Taljaard, *et al.*, 2019), the update to the 2011 National Biodiversity Assessment, reported on and confirmed this further degraded state.

The Recommended Ecological Category, or desired state, for the iKongeni is a Category D (DWS, 2015b). As such, management interventions should aim toward preventing further ecological degradation of the system with key interventions including restoring estuarine habitat, improving water quality and reducing base flows to the estuary to maintain the mouth state and salinity profile (DWS, 2015b). According to the Ecological Reserve study, the D Category can be achieved under the current situation by removing half the waste and flow of current discharges (DWS, 2015a, 2015b). However, this has major socio-economic implications and will be difficult to achieve. Therefore, the Target Ecological Category, which considers all users of the system, was set to maintain the PES below a D. Notwithstanding, this is unacceptable on ecological grounds (DWA, 2011).

Goods and services or human use activities

Ecosystem goods and services are the products that emerge from the natural environment through various biological, chemical, and physical processes and functions, which are typically used by people and contribute to enhanced societal wellbeing. The types of ecosystem services include provisioning services (such as food, water and other resources), regulating services (e.g. climate regulation, as well as air and water purification), life-support services (such as nutrient cycling and soil formation) and cultural services (e.g. aesthetic, spiritual, recreational, educational and cultural benefits) (Van Niekerk and Turpie, 2012).

The level of ecosystem services provided by the iKongeni estuary were deemed to be low, directly related to the history of human modifications to the estuary and its catchment, and the concomitant loss of ecological infrastructure. The main ecosystem services currently offered relate to water quality improvement (i.e., waste treatment through dilution and assimilation), the export of nutrients and materials to the marine environment, socio-cultural services, namely recreational activities in the form of canoeing / boating, angling, as well as aesthetic appreciation (supporting tourist and residential accommodation needs). The latter was rated to be of high importance (DWA, 2013). Le Roux et al., (2005) advise that both the iKongeni estuary, as well as the previous Blue Flag status, makes a significant contribution to the perception of Margate as a favourable tourist destination. The provision of fish and crustacean nursery services, migratory corridors and protection of biodiversity is rated as medium (DWA, 2013) given the collective importance of degraded estuaries along the KZN south coast. Subsistence use of the system has been observed; however, overall usage is considered low. Other services include contribution to primary productivity, storm/wave damage control, flood attenuation and erosion control, and preservation of natural heritage (Le Roux *et al.*, 2005; Breetzke and Meyer, 2012).

Geographical socio-economic context

The Situation Assessment Report unpacks the demographics of the Ray Nkoneyni Municipality detailing its geographical context, population statistics, dependency ratios and service provision. The municipalities economic profile and status as district economic driver, is then expounded noting the tourism tertiary section leading the economy and the role of environmental assets and coastal infrastructure play in making the municipality and Margate itself key tourism destinations. As such, the improvement, protection and ongoing maintenance of these aspects is vital to retaining and attracting new tourists, investment and economic development (TPS, 2018).

Margate town itself is then outlined focussing on its role as a tourism intensity / municipal development node (RNM, 2019) with the redevelopment of the Margate Beach Front as an example of a proposed catalytic project. The Margate planning scheme and scheme controls were evaluated in preparation for the proposed zonation of activities and spatial depiction of the estuaries envisaged desired state.

Three key socio-economic considerations are thereafter elaborated upon, namely, the Margate Main Beach's former Blue Flag status, secondly the municipalities, town and surrounding property owner's dependency on the state of the system and its direct and indirect impact on livelihoods. This included the current poor quality of the public space encouraging / supporting poor / unsocial behaviour with the dumping of grass cuttings and solid waste, the defacing of public and private infrastructure, illegal land reclamation and the poor maintenance of defence. The third aspect considered related to coastal vulnerability and risk, anticipated sea-level rise and the designation of coastal management lines.

Current or Potential Pressures and Impacts

The iKongeni estuary is a highly transformed system with the level of cumulative pressure on the estuary being very high (Van Niekerk, Adams, Lamberth, Taljaard, *et al.*, 2019). The environmental processes, activities and developments that currently impact the system and pose future threats were deliberated, concentrating on: land-use and infrastructure development (urban development; road infrastructure; and bulk infrastructure); water quality and quantity issues (water quality deterioration; altered flow and invasive alien plants); exploitation of natural resources (harvesting of living resources; urban development and mouth manipulation); and environmental hazards (climate change; flooding, drought and coastal dynamics).

Opportunities and Constraints

A Strengths, Weaknesses, Opportunities and Threats analysis was conducted for the management of the iKongeni estuary, and estuarine management in the Ray Nkoneyni Municipality in general and has been crudely divided into ecological, socio-economic and institutional spheres, however many of the recorded items are cross-cutting.

Firstly, the ecological analysis identifies the systems strengths as been that it is still worth preserving and that there is a level of community buy-in. In comparison the system is highly degraded as a result of intense urban impacts, notably poor water quality, with limited, if any, assimilative capacity. Opportunities for positive change include improving the health status, undertaking research and rehabilitating degraded areas, developing standard operating procedures for emergencies and formalising both a monitoring programme and relationships with the iKongeni Conservancy and other NGO's. Threats are identified as anticipated increasing development, increased recreational pressure and pollution and continued flood risk to low-lying developments.

Secondly, from a socio-economic perspective, the estuary possesses high aesthetic and recreational value and is part of the foundation of the tourism industry, however, lack of awareness, artificial breaching and negative public perceptions need to be improved. Opportunities identified include establishing a community-based advisory forum; increasing public awareness and education on estuarine health, function and value, as well as downstream impacts of catchment activities with the resultant improved estuarine value and knock-on improvement for the local economy. Threats include continued unsustainable land-use; indiscriminate artificial breaching and continued conflict between preserving estuarine integrity versus human life and poorly located development.

Finally, from an institutional perspective, relevant institutional structures do exist and estuarine specific support is provided by provincial government, however, there appears to be poor inter-governmental cooperation, and seemingly overlapping mandates, restricted institutional resources and lack of clarity in respect to processes and implementation actions. Opportunities identified include the development of standard operating procedures in cases of emergency and clean-up operations; Public-private partnerships between various government departments, agencies and institutions (e.g., iKongeni Conservancy) and potential access to additional funding from National Government. Unfortunately, issues that could prevent the success include continued ignorance of authority roles and responsibilities; non- implementation of management actions / project plans; reallocation of funds; lack of political will and lack of communication and co-operative governance.

Information gaps to be addressed in the plan

Despite the highly degraded state of the iKongeni estuary, it is critically important in terms of tourism that it maintains some ecological value as a coastal habitat in an otherwise urban environment. Physical, chemical and biological information on the iKongeni estuary is either scarce or the available data is significantly outdated. As such specific recommendations are made with the view of preventing further degradation of the iKongeni estuary: maintaining basic monitoring; undertaking co-ordinated research; establishing the contribution of the estuary to the regional estuarine nursery function; compiling an inventory of estuarine pollution sources (including volumes of discharged treated wastewater); determining the 1:100-year flood line; and updating the economic evaluation of the ecosystem goods and services provided by the iKongweni estuary.

4. VISION AND MANAGEMENT OBJECTIVES

4.1. Vision

The RNM is situated on the KZN south coast and is identified as the RMA as per the Protocol. In 2017 the RMN developed EMPs for seven of their estuaries, namely the iBilanhlolo estuary; Mhlangamkhulu estuary; Mhlangeni estuary; Tongasi estuary; Umtwentweni estuary; Mbango estuary; and the Umzimkulu estuary. As part of that process a collection or shared Vision was developed as follows:

The estuaries of the Ray Nkonyeni Municipality are managed sustainably as functioning, healthy and attractive ecosystems to the benefit of all

Due to constraints associated with the on-line format of the meeting, and as a result of the key word exercise previously undertaken, this generic RNM estuaries Vision was presented for discussion during this process. A period of general discussion took place around the unique aspects of the iKongeni estuary. Based on this discussion the following amended Vision is proposed:

The iKongeni estuary, a highly transformed urban system, remains a key tourism and economic asset for the Ray Nkonyeni Municipality, and is managed sustainably as a functioning, healthy and attractive ecosystem for the benefit of all

4.2. Current impacts and threats

The iKongeni estuary is a highly transformed system. The 2018 NBA considers the level of cumulative pressure on the estuary to be very high (Van Niekerk, Adams, Lamberth, Taljaard, *et al.*, 2019).

The environmental processes, activities and developments that currently impact the system and pose future threats are discussed in the categories and issues detailed in Figure 2.

The impacts affecting summarised in

Table 2 below.

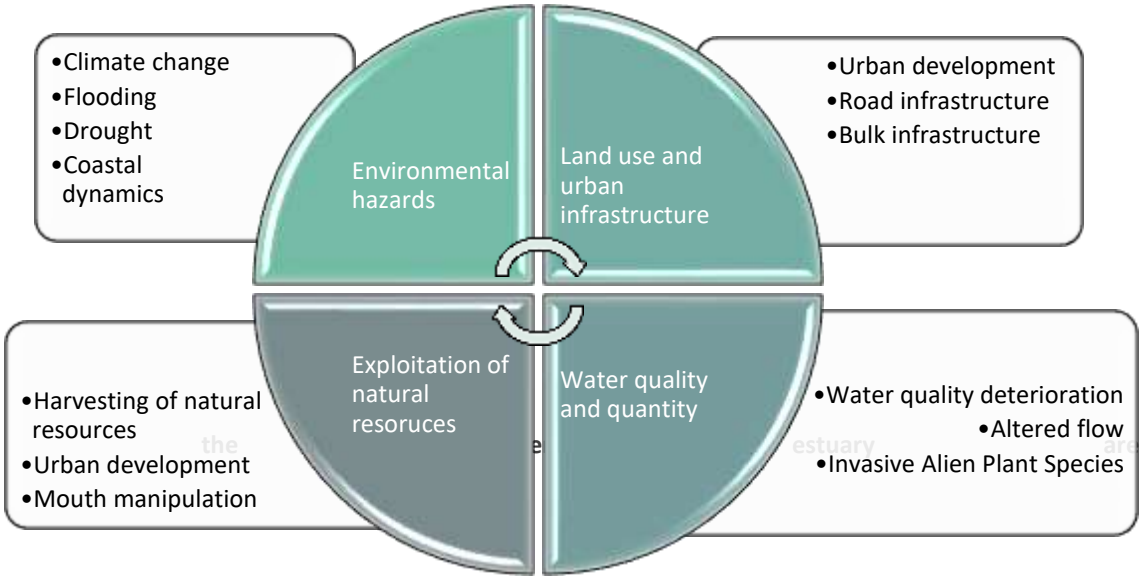

Figure 2: Overview of current impacts and threats facing the iKongeni estuary

Table 2: Current impacts/pressures facing the iKongeni estuary (Breetzke *et al*., 2020)

THREATS	COMMENTS	2018 NBA Rating
1. Flow modification *(Freshwater additions and diversions)*	The WWTW discharges direct to the marine environment through a surf zone pipeline at Lucien Beach. The estuary is subject to additional freshwater input through alleged discharges from the WWTW. This has affected the natural flow regime and mouth dynamics.	Very High
2. Pollution: Eutrophication	The system is subject to frequent spillages of raw sewage and discharges from the WWTW works, causing excessive faecal contamination, eutrophication and fish kills.	Very High
3. Pollution: Chemical contamination	The system receives domestic effluent from the Margate sewage network and run-off containing urban contaminants (heavy metals, fuels, oils and greases) entering the system through numerous roadside stormwater systems, as well as service station spillages. There are numerous car wash facilities around the estuary that would contribute toxic soaps and other cleaning agents to the system.	Very High
4. Pollution Litter/debris	Litter and solid waste dumping on the estuary margins were particularly noteworthy in the upper reaches in proximity to the R61 road bridge.	Very High
5. Habitat Loss	There has been significant urban encroachment and transformation of the EFZ through infilling, sedimentation, and clearing of natural vegetation, which have contributed to major habitat loss within the system. The catchment area is heavily urbanised. Infilling and reclamation following flood erosion upstream of the estuary.	Very High
6. Overexploitation	Subsistence fishing was observed; however, this is likely to be low and opportunistic. Recreational fishing and bait harvesting are likely to increase during peak holiday season despite poor water quality and health risks.	Medium
7. Mouth manipulation	Historical breaching has occurred to prevent erosion to beach amenities and enable access to Margate Main beach for holiday makers. Unauthorised breaching has been reported and "recreational" breaching by holiday makes is also a likely occurrence. *Artificial breaching should now be in line with the approved mouth maintenance management plan, proposed to be updated.*	Unauthorised
8. Invasive alien species	There is modest level of IAP infestation along the estuary. It is estimated that IAPs do not comprise more than 15% of the total vegetation component	Low
9. Sea-level rise	By virtue of the wide seafront, shortness of the estuary water body, and limited natural remaining coastal vegetation, the risk of sea-level rise is high.	High

4.3.Key objectives

Based on the generic RNM key objectives / generic management objective 'categories', the iKongeni EMP key objectives are detailed in Figure 2. Overarching

management or key objectives for the iKongeni estuary are detailed in Table 3.

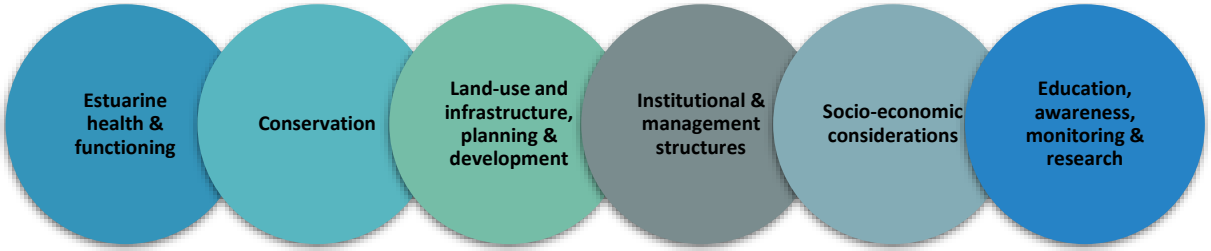

Figure 2 : Sectors or categories of issues relevant to estuarine management in the Ray Nkonyeni Municipality as well as the iKongeni estuary

Table 3: Key Objectives for the management of the iKongeni estuary, their indicators and level of priority

	Sector / Category	Key Objective	Indicators	Priority
1	Estuarine health and functioning	The ecological health and natural functioning of the iKongeni estuary is improved and safeguarded	• Ecological health of estuaries is improved with sewage inflows prevented and water quality improved • Estuarine habitat is regained and restored • The mouth is effectively managed	**High**
2	Conservation	The remaining biodiversity and estuarine habitats of the iKongeni estuary are conserved	• Estuarine habitat is regained and restored • Invasive Alien Plants are controlled • Resources are sustainably utilised	**High/ Medium**
3	Land-use and Infrastructure Planning and Development	All developments and proposed changes in land-use, including infrastructure, which impacts or could impact on the iKongeni estuary, are assessed and regulated	• Effective implementation of EMP ensured • Impacts of climate change are minimised • All development and land use changes surrounding and within the EFZ comply with environmental legislation and environmental best practice / risk aversion approach	**High/ Medium**
4	Institutional and Management Structures	Effective management and co-operative governance of the iKongeni estuary	• Estuarine management co-ordination function undertaken by Ugu DM until recommended estuarine management co-ordinator appointed • Estuarine bylaws are drafted (or environmental bylaws updated) • Ugu estuary sub-committee of the Ugu MCC established (Regional Estuary Advisory Forum) and ongoing meetings held	**High**
5	Socio-economic considerations	Socio-economic benefits are enhanced and regulated to ensure sustainable resource use	• Safe, clean and equitable access maintained. • Recreational use regulated. • Economic opportunities maximised.	**Medium**
6	Education, awareness, monitoring and research	The value and importance of the iKongeni estuary is well understood and made known to members of society	• Signage erected; information disseminated; awareness increased. • Knowledge and understanding enhanced through monitoring	**Medium**

5. MANAGEMENT OBJECTIVES AND ACTIVITIES

The scoping phase Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis (Table 4), critical issues identified, as well as stakeholder engagement informed the management objectives and activities.

Table 4: SWOT analysis

Ecological Strengths *(highlights, uniqueness?)*	**Weaknesses *(what could be improved?)***
ECOLOGICAL • Estuary retains biodiversity worth preserving • Estuary still provides ecosystem good and services worth preserving • Water quality monitoring undertaken, some data is available • Conservancy members partake in water quality sampling on behalf of Ugu DM • Active conservancy and concerned citizens, with some riparian owners/conservancy members committed to biodiversity conservation	ECOLOGICAL • Estuary currently in a largely modified state, but at tipping point to highly degraded state • Numerous intense urban impacts (habitat loss and transformation, severe urban encroachment, pollution, etc.) • Poor water quality due WWTW discharge, faulty/failing sewage infrastructure and urban run-off • Limited assimilative capacity • Invasive alien vegetation • Inappropriate development in floodplain • Artificial breaching
SOCIO-ECONOMIC • Estuary possesses high aesthetic and socio/economic (recreational) value • Coastline is the foundation of the tourism industry and RNM economy • Outstanding nature-based and cultural tourism destination	SOCIO-ECONOMIC • Artificial breaching • Lack of public awareness • Negative public perceptions of drained systems and water pollution • Poor water quality due WWTW discharge, faulty/failing sewage infrastructure and urban run-off
INSTITUTIONAL • RNM Environmental committee as well as Ugu District Coastal Committee in existence • Support from EDTEA and Ezemvelo KZN Wildlife for estuarine management	INSTITUTIONAL • Poor inter-governmental cooperation, and seemingly overlapping mandates • Lack of commitment of local and district municipalities and low accountability • Restricted institutional resources, particularly funding to implement critical projects (e.g. sanitation refurbishment) • Lack of clarity regarding applicability of municipal environmental by-laws • Lack of environmental awareness • Lack of policing, and compliance and enforcement monitoring • Lack of enforcement of laws, policies, regulations and bylaws • Limited local information / data

Opportunities ***(Opportunities for positive change)***	**Threats** ***(what could prevent the EMP from working?)***
ECOLOGICAL • Improve the health status of the estuary and reduce pollution incidents and negative impacts • Develop standard operating procedures (SOPs) in cases of emergency (e.g., pollution, flooding, land slippage), including SOP for clean-up operations • Engage and formalise relationships with the iKongeni Conservancy (and other NGOs) as a watch dog for environmental incidents • Rehabilitate degraded areas • Establish water quality monitoring programme • Ecological scientific research	ECOLOGICAL • Estuaries are the endpoint of unregulated inland issues (catchment scorecard) • Increasing development – population growth, increased service provision, more recreational pressure and more pollution of the environment • Flood risk to low-lying developments • Upstream contaminants from known and unknown sources • Climate change impacts (Sea Level Rise, flooding & erosion) • Catchment erosion, sedimentation and shallowing of estuaries • Unsustainable land-use (agriculture, contaminating industries, mining) • Indiscriminate artificial breaching by land owners and holiday makers
SOCIO-ECONOMIC • Establish community-based advisory forum using conservancy and business owners to assist municipality/authorities, which allows designated members to take action • Increase public awareness and education on estuarine health, function and value, as well as downstream impacts of catchment activities • Improved estuarine value will have knock-on improvement for the local economy	SOCIO-ECONOMIC • Unsustainable land-use (agriculture, contaminating industries, mining) • Indiscriminate artificial breaching by land owners and holiday makers • Conflict between preserving estuarine integrity versus human life and developments
INSTITUTIONAL • Develop standard operating procedures (SOPs) in cases of emergency (e.g., pollution, flooding, land slippage), including SOP for clean-up operations • Public-private partnerships between various government departments, agencies and institutions (e.g., iKongeni Conservancy) • Instate policing/improved policing • Ugu District Municipality can utilise this information to facilitate access to additional funding from DWS	INSTITUTIONAL • Ignorance of authority roles and responsibilities • Non implementation of management actions / project plans • Reallocation of funds • Lack of political will • Lack of communication and co-operative governance between municipalities • Slow approval processes (e.g., Bilanhlolo MMP) • Changing legislation and policy

Figure 3 below represents an overview of the management objectives for the management of the iKongeni estuary. Management objectives are grouped according to the key objectives, sectors or categories of issues. Proposed activities, unpacked per management objective, are included and detail the ecological and socio-economic consequences of no action, expected availability of human resources, estimated cost and expected duration of activity. These more comprehensive lists are included to provide assistance in the selection of management priorities for the 5-year cycle of this EMP.

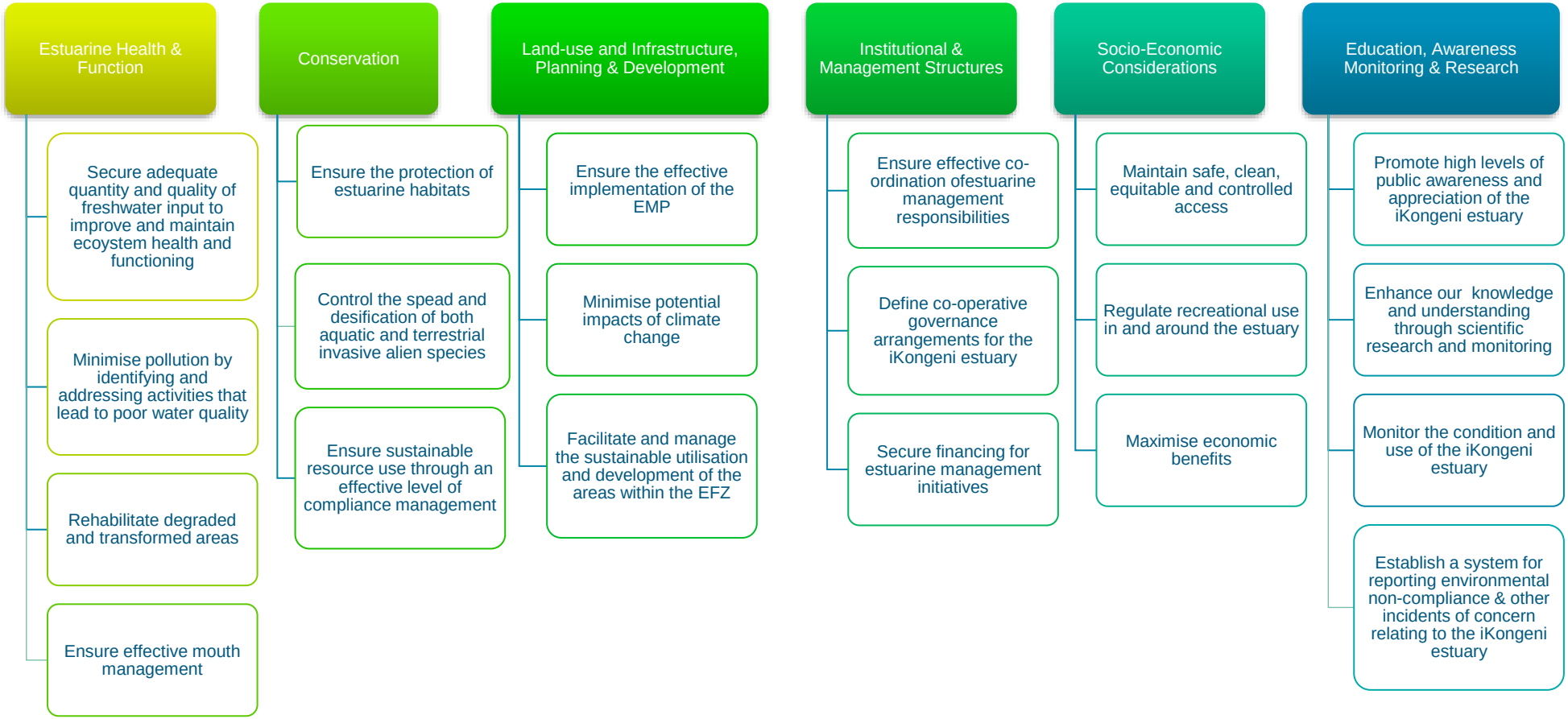

Figure 3: Management Objectives for the iKongeni estuary

5.1. Estuarine Health and Functioning

The first key objective, namely estuarine health and functioning, is detailed in Table 5 below.

Table 5: Key Objective 1: Estuarine health and functioning

PROPOSED ACTIVITY	ECOLOGICAL IMPACT/SOCIO-ECONOMIC CONSEQUENCES OF NO ACTION	EXPECTED AVAILABILITY OF HUMAN RESOURCES	ESTIMATED COST	EXPECTED DURATION
Key Objective 1: The ecological health, natural functioning and biodiversity of the iKongeni estuary is improved and safeguarded				
Management Objective 1.1: Secure adequate quantity and quality of freshwater input to improve and maintain ecosystem health and functioning				
Follow up on implementation of the water resource classification process and protection of the ecological reserve	Further degradation of the estuary, continued unsustainable abstraction and loss of functioning	Resources available in Municipality, DWS as well as NGOs	Part of mandate	Once classified
Management Objective 1.2: Minimise pollution by identifying and addressing activities that lead to poor water quality				
Confirm identified sources and types of pollution (and maintain a spatially explicit register) in order to take steps to remedy or mitigate	Continued pollution of system and resultant negative impacts on biodiversity, tourism and human health	Ugu/ RNM have limited resources available	Part of mandate	ongoing
Undertake necessary repairs, upgrades and expansions of sewage infrastructure as per the Ugu Water Services Master Plan (WSMP)	Continued pollution of system and resultant negative impacts on biodiversity, tourism and human health	Financial resources allocated with phased implementation, additional budget required	>R10 m	ongoing
Improve treatment of wastewater (as per the Ugu WSMP)	Poor water quality, eutrophication and resultant negative impacts on biodiversity, tourism and human health	Limited financial resources allocated to maintenance & scarce skills to implement	>R10 m	ongoing
Include estuary in Ugu WSMP (monitoring) and Integrated Waste Management Plan (IWMP)	Poor water quality, eutrophication and resultant negative impacts on biodiversity, tourism and human health	Ugu/ RNM have limited resources	Part of mandate	Cyclical review
Continue to support the **Sihlanzimvelo Stream Cleaning Project**	Accumulation of pollution and resultant negative impact on biodiversity, tourism and human health	Resources available in District Municipality	Ugu DM project	Cyclical review
Participate in **'Adopt-a-river' / 'Adopt-a-stretch' programme** to facilitate solid waste clean up	Accumulation of pollution and resultant negative impact on biodiversity, tourism and human health	Resources available in District Municipality, DWS as well as I&APs / Active and responsible citizenry	Transport and catering costs for events	Bi-annual events

PROPOSED ACTIVITY	ECOLOGICAL IMPACT/SOCIO-ECONOMIC CONSEQUENCES OF NO ACTION	EXPECTED AVAILABILITY OF HUMAN RESOURCES	ESTIMATED COST	EXPECTED DURATION
Approve and implement the draft SOP (contingency plan) for response irt emergency events (e.g., pollution spills) including early warning system and procedures for incident reporting, *ad hoc* monitoring etc.	Un-coordinated, *ad hoc* and delayed responses to emergencies/events/incidents and resultant negative impacts on biodiversity, tourism and human health	Resources available in Municipality	Part of mandate	On-going
Investigate use of sustainable urban drainage systems (SUDS) for stormwater run-off	Continued contaminated stormwater run-off, erosion and sedimentation	Resources available in Municipality, buy-in required	R50 000	Once off training event
Integrated iKongeni River/estuary stormwater issues into the proposed RNM Stormwater Management Master Plan	Flooding, pollution and damage to infrastructure and resultant negative impacts on biodiversity, tourism and human health	Resources available in Municipality	Part of mandate	ongoing
Management Objective 1.3: Rehabilitate degraded and transformed areas				
Develop and implement rehabilitation programme (with ongoing care of rehabilitated areas) based on EMP recommendations	Continued degradation of the estuarine habitat and biodiversity within the EFZ	Resources available in EPIP programmes (WftC, WfW)	>R5 M	ongoing
Lobby for landowners and respective companies to rectify damages/degraded areas on their property	Continued degradation of the estuarine habitat and biodiversity within the EFZ	Resources available in RNM, EDTEA, Ezemvelo KZN Wildlife, I&APs (conservancies)	Part of mandate	Ongoing negotiations until programme developed
Management Objective 1.4: Ensure effective mouth management				
Any breaching is undertaken in accordance with both the updated Mouth Management Plan (once approved), and an approved Maintenance Management Plan (MMP), both which should be assessed at authorities' workshop (to be convened ASAP)	Carte blanch artificial breaching, interference with natural estuarine functioning, resultant negative impacts on biodiversity and tourism	Specific responsibility of Environmental Management and Signage Control, supported by external service provider	Part of mandate	ongoing
Negotiate feasibility of RNM preferred permanent sub-terrain groyne to relocate the estuary mouth	Ongoing maintenance and costs	Capital budget easier to motivate for than maintenance budget	>R8 M	unknown

5.2.Conservation

The second key objective, conservation (biodiversity protection), is detailed in Table 6 below. It should be noted that this key objective differs from the 'Conservation' generic key objective contained in the generic RNM EMP as a result of no formally protected areas being included in respect to the iKongeni estuary.

Table 6: Key Objective 2: Conservation

PROPOSED ACTIVITY	ECOLOGICAL IMPACT/SOCIO-ECONOMIC CONSEQUENCES OF NO ACTION	EXPECTED AVAILABILITY OF HUMAN RESOURCES	ESTIMATED COST	EXPECTED DURATION
Key Objective 2: The remaining biodiversity and estuarine habitats of the iKongeni estuary are conserved				
Management Objective 2.1: Ensure the protection of estuarine habitats				
Adopt and implement the spatial zonation plan (incorporate in SDF/LUMS)	Continued loss/degradation of EFZ and estuarine resources	Specific responsibility of RNM Manager Town Planning	R50 000	Initial action, Ongoing
Develop and publish estuarine bylaws to support spatial zonation or update the existing environmental bylaws to include estuarine management	Continued loss/degradation of EFZ and estuarine resources	Appointment of service provider required	R70 000	Once off
Instate educational signage to promote the preservation of the biodiversity within the iKongeni EFZ	Lack of knowledge and awareness of zonation of activities	Specific responsibility of Environmental Management and Signage Control	R50 000	Initial action, and then as when required
Management Objective 2.2: Control the spread and densification of both aquatic and terrestrial invasive alien plant species				
Implement the existing RNM invasive species eradication/maintenance (IAP) programme on municipal owned land	Continued spread of invasive species	Municipal resources available	Part of mandate	Ongoing
Management Objective 2.3: Ensure sustainable resource use through an effective level of compliance management				
Adopt and implement spatial zonation plan using land beacons/signage where required	Lack of knowledge and awareness of zonation of activities Ongoing inappropriate activities, behaviour and potential accidents Disturbance to and over exploitation of living resources	Specific responsibility of RNM	Part of mandate, Capital expenditure R40 000	Initial action, and ongoing maintenance

PROPOSED ACTIVITY	ECOLOGICAL IMPACT/SOCIO-ECONOMIC CONSEQUENCES OF NO ACTION	EXPECTED AVAILABILITY OF HUMAN RESOURCES	ESTIMATED COST	EXPECTED DURATION
Enforce compliance with spatial zonation plan and associated by-laws governing human activities (e.g., habitat preservation)	Lack of knowledge and awareness of zonation of activities Ongoing inappropriate activities, behaviour and potential accidents Disturbance to and over exploitation of living resource	DFFE has limited resources (i.r.t. MLRA), RNM has limited resources	Part of mandate	Ongoing
Investigate and implement measures to control the use of living resources (i.e., MLRA) (Patrols by conservancy members / ad hoc compliance and monitoring)	No control of estuarine resources and resultant negative impacts on biodiversity and tourism	DFFE has limited resources	Part of mandate	Ongoing

5.3. Land-use and Infrastructure Planning and Development

The third key objective, land use and infrastructure, planning and development, is detailed in Table 7 below.

Table 7: Management Objective 3: Land Use and Infrastructure Planning and Development

PROPOSED ACTIVITY	ECOLOGICAL IMPACT/SOCIO-ECONOMIC CONSEQUENCES OF NO ACTION	EXPECTED AVAILABILITY OF HUMAN RESOURCES	ESTIMATED COST	EXPECTED DURATION
Key Objective 3: All developments and proposed changes in land-use, including infrastructure, which impacts or could impact on the iKongeni estuary, are assessed and regulated				
Management Objective 3.1: Ensure the effective implementation of the EMP				
Ensure the incorporation of the iKongeni EMP into IDP and SDF	Wasted expenditure and uncoordinated estuarine management Continued degradation of EFZ and negative impacts on biodiversity, tourism and human health	Specific responsibility of RNM Manager Town Planning	Part of mandate	Cyclical review
Ensure that estuary spatial zonation and land use controls are reflected in the SDF and LUMS (during review cycle)	Continued degradation of EFZ, including habitat loss/destruction Wasted expenditure	Specific responsibility of RNM Manager Town Planning	Part of mandate	Cyclical review

PROPOSED ACTIVITY	ECOLOGICAL IMPACT/SOCIO-ECONOMIC CONSEQUENCES OF NO ACTION	EXPECTED AVAILABILITY OF HUMAN RESOURCES	ESTIMATED COST	EXPECTED DURATION
Management Objective 3.2: Minimise the potential impacts of climate change				
Undertake hydrological study for the iKongeni catchment and encourage risk averse measures by land owners in high-risk areas identified	Continued degradation of EFZ and negative impacts on biodiversity, tourism and human health Inappropriate development and potential damage to property and loss of human life	Support from external service provider required	~R400 000	Once off study
Determine and designate the Coastal Management Line (CML)	Continued degradation of EFZ and negative impacts on biodiversity, tourism and human health Inappropriate development and potential damage to property and loss of human life	Resources within EDTEA and ORI currently supporting this process	Part of provincial mandate	Approximately 1 year
Incorporate CML into SDF / LUMS	Continued degradation of EFZ and negative impacts on biodiversity, tourism and human health Inappropriate development and potential damage to property and loss of human life	Resources available in Municipality	Part of mandate	Once CML designated and then in review cycle
Encourage environmentally friendly developments/developers and maintain sound/ innovative building techniques	Inappropriate development and potential damage to property and loss of human life Unsustainable development practice	Resources available in Municipality (Building control) and EDTEA	Part of mandate	ongoing
Consider innovative/practical solutions to upgrading the bridge over the iKongeni estuary	Continued degradation of EFZ and negative impacts on biodiversity, tourism and human health	Limited financial resources, needs to be part of consolidated capital budget/MIG funding	>R10M	unknown
Management Objective 3.3: Facilitate and manage the sustainable utilisation and development of the areas within the EFZ				
Ensure that all proposed developments adhere to the full suite of relevant environmental legislation	Continued degradation of EFZ and negative impacts on biodiversity, tourism and human health. Inappropriate development and potential damage to property and loss of human life. Unsustainable development practice	Resources within RNM, EDTEA, DMR and DWS	Part of mandate	ongoing
Undertake compliance monitoring for new structures being built	Unsustainable development practice and potential environmental damage	Resources within RNM and EDTEA	Part of mandate	ongoing

5.4. Institutional and Management Structures

The fourth key objective, institutional and management structures, is detailed in Table 8 below.

Table 8: Management Objective 4: Institutional and Management Structures

PROPOSED ACTIVITY	ECOLOGICAL IMPACT/SOCIO-ECONOMIC CONSEQUENCES OF NO ACTION	EXPECTED AVAILABILITY OF HUMAN RESOURCES	ESTIMATED COST	EXPECTED DURATION
Key Objective 4: Effective management and co-operative governance of the iKongeni estuary				
Management Objective 4.1: Ensure effective co-ordination of estuarine management responsibilities				
Establish an effective and sustainable organisational structure for co-ordinating estuarine management activities. Appoint an Estuarine Management Co-ordinator (EMC) in the long term	Uncoordinated and ineffective implementation of EMP. Potential damage to EFZ with resultant negative impacts on biodiversity, tourism, property and human health	Limited resources in RNM. Short term allocation of responsibility to existing Ugu DM resource	~R300 000 per annum	ongoing
Individual agencies to identify and address training needs among staff involved in estuarine management (RNM, Ugu, DWS, DFFE (e.g., for monitoring, visitor regulation and assistance, etc)	Uninformed and ineffective co-ordination of management interventions	Support external service provider required	~R6 000 per candidate per course	Ad hoc
Monitor and report on the progress of EMP actions and achievements (and report back at Ugu Municipal Coastal Committee (MCC) estuarine sub-committee meetings)	Uncoordinated and ineffective implementation of EMP Potential damage to EFZ with resultant negative impacts on biodiversity, tourism, property and human health	Capacity constraints reported	Part of mandate	Quarterly (municipal) and annual (DEA) reporting
Ugu DM to chair Ugu MCC estuarine sub-committee meetings. iKongeni estuary to be included on the agenda	Uncoordinated and ineffective implementation of EMP Potential damage to EFZ with resultant negative impacts on biodiversity, tourism, property and human health	Interim responsibility of Ugu DM: Environmental Management	Part of mandate	Quarterly meetings
Develop (or update) appropriate bylaws pertaining to key estuarine issues (e.g., clearance of vegetation for views, conservation of estuarine habitat, permissible/non permissible uses/activities i.r.t. to spatial zonation, e.g., boating)	Ineffective implementation and compliance with EMP Potential damage to EFZ with resultant negative impacts on biodiversity, tourism, property and human health	Interim responsibility of Environmental Management and Signage Control, supported by external service provider	~R150 000 per bylaw	Ongoing

PROPOSED ACTIVITY	ECOLOGICAL IMPACT/SOCIO-ECONOMIC CONSEQUENCES OF NO ACTION	EXPECTED AVAILABILITY OF HUMAN RESOURCES	ESTIMATED COST	EXPECTED DURATION
Management Objective 4.2: Define co-operative governance arrangements for the iKongeni estuary				
RNM/Ugu DM to obtain agreement from government departments and other participating agencies in respect of their roles and responsibilities in estuarine management (and the implementation of this EMP)	Uncoordinated and ineffective implementation of EMP Potential damage to EFZ with resultant negative impacts on biodiversity, tourism, property and human health	Interim responsibility of Ugu DM: Environmental Management	Part of mandate	Ongoing
Convene quarterly meetings to address estuarine matters and discuss progress on management actions	Uncoordinated and ineffective implementation of EMP Potential damage to EFZ with resultant negative impacts on biodiversity, tourism, property and human health	Interim responsibility of Ugu DM: Environmental Management	R20 000 per annum	Ongoing
Maintain a stakeholder database for the dissemination of information	Uninformed stakeholders	Interim responsibility of Ugu DM: Environmental Management	Part of mandate	Ongoing
Ugu MCC estuarine sub-committee contributes to 5-year review of EMPs	Uncoordinated and ineffective implementation of EMP Potential damage to EFZ with resultant negative impacts on biodiversity, tourism, property and human health	Interim responsibility of Ugu DM: Environmental Management	Part of mandate	5 yr. Cyclical review
Ugu MCC estuarine sub-committee to be represented at the Pongola - Umzimkulu CMA forum to ensure that estuarine matters are tabled	Uncoordinated and ineffective implementation of EMP. Potential damage to EFZ with resultant negative impacts on biodiversity, tourism, property and human health	Interim responsibility of Ugu DM: Environmental Management	Part of mandate	Ongoing
Management Objective 4.3: Secure financing for estuarine management initiatives				
Individual government agencies to make provision for the necessary resources in the short, medium and long-term expenditure frameworks to create and fill posts, and acquire necessary infrastructure and resources for effective management of the iKongeni estuary	Ineffective implementation of EMP, Potential damage to EFZ with resultant negative impacts on biodiversity, tourism, property and human health	Limited resources, respective lead agencies	Part of mandate	unknown

PROPOSED ACTIVITY	ECOLOGICAL IMPACT/SOCIO-ECONOMIC CONSEQUENCES OF NO ACTION	EXPECTED AVAILABILITY OF HUMAN RESOURCES	ESTIMATED COST	EXPECTED DURATION
Individual government agencies to develop long-term financial plans	Ineffective implementation of EMP, Potential damage to EFZ with resultant negative impacts on biodiversity, tourism, property and human health	Specific responsibility of Environmental Management and Signage Control and respective lead agencies	Part of mandate	Within cyclical requirements

5.5. Socio-economic Considerations

The fifth key objective, socio-economic considerations, is detailed in Table 9 below.

Table 9: Management Objective 5: Socio-economic considerations

PROPOSED ACTIVITY	ECOLOGICAL IMPACT/SOCIO-ECONOMIC CONSEQUENCES OF NO ACTION	EXPECTED AVAILABILITY OF HUMAN RESOURCES	ESTIMATED COST	EXPECTED DURATION
Key Objective 5: Socio-economic benefits are enhanced and regulated to ensure sustainable resource use				
Management Objective 5.1: Maintain safe, clean, equitable and controlled access				
Maintain controlled access	Potential damage to estuarine habitat and overexploitation of estuarine resources	Limited resources within RNM, private/public /partnerships required	Part of mandate	ongoing
Identify security hotspots and increase security presence particularly during peak seasons	Unsafe environment and proliferation of insalubrious behaviour. Increase in crime	Limited resources within RNM	Part of mandate	ongoing
Management Objective 5.2: Regulate recreational use in and around the estuary				
Adopt, demarcate and enforce EFZ	Continued loss/degradation of EFZ and estuarine resources	Resources available in RNM	~R30 000	Initial action, Ongoing
Informative signage to be placed at strategic points	Unprotected / unsafe environment with resultant negative impacts on biodiversity, tourism, property and human health and safety	Specific responsibility of Manager: Environmental Management and Signage Control	~R30 000	Initial action, Ongoing
Management Objective 5.3: Maximise economic benefits				
Maximise livelihoods options	Potential overexploitation of estuarine resources, limited appreciation of estuarine resources and attributes, reduced buy-in from local communities	Specific responsibility of Manager: environmental Management and Signage Control, supported by external service provider	R150 000	6-month study
Maintain/increase the direct and indirect level of socio-economic dependency on the system	Decreased income earning opportunities, limited appreciation of estuarine resources and attributes, reduced buy-in from neighbouring land owners	Resources available in RNM	Part of mandate	Ongoing

5.6. Education, Awareness, Monitoring and Research

The sixth and final key objective, education, awareness, monitoring and research, is detailed in Table 10 below.

Table 10: Management Objective 6: Education, Awareness, Monitoring and Research

PROPOSED ACTIVITY	ECOLOGICAL IMPACT/SOCIO-ECONOMIC CONSEQUENCES OF NO ACTION	EXPECTED AVAILABILITY OF HUMAN RESOURCES	ESTIMATED COST	EXPECTED DURATION
Key Objective 6: The value and importance of the iKongeni estuary is well understood and made known to members of society				
Management Objective 6.1: Promote high levels of public awareness and appreciation of the value of the iKongeni estuary				
Develop an effective education and awareness programme for the residents and visitors	Potential overexploitation of estuarine resources, limited appreciation of estuarine resources and attributes, reduced buy-in from local communities and visitors	Specific responsibility of Manager: education and Waste Minimisation with support from Specific responsibility of Manager: environmental Management and Signage Control	Part of mandate	3 months
Source and/ or commission educational and informative material including signage, posters, pamphlets and webpage design	Potential overexploitation of estuarine resources, limited appreciation of estuarine resources and attributes, reduced buy-in from local communities and visitors		~R100 000	Initial action, Ongoing
Management Objective 6.2: Enhance our knowledge and understanding through scientific research and monitoring				
Identify information gaps and develop research ToR aimed at gathering/ consolidating data on biodiversity	Limited appreciation of estuarine resources and attributes with resultant negative impacts on biodiversity, tourism, property and human health and safety	Specific responsibility of Manager: education and Waste Minimisation with support from environmental Management and Signage Control	Part of mandate	3-month project
Engage academic and research institutions, government departments and parastatals (e.g., DFFE, SANBI) to undertake and/or collaborate on priority research projects	Inability to undertake research and resultant lack of knowledge and understanding of systems		Part of mandate	Ongoing
Solicit research funding support	Inability to undertake research and resultant lack of knowledge and understanding of systems		Undetermined	Ad hoc
Management Objective 6.3: Monitor the condition and use of the iKongeni estuary				
Monitor number of users on system to determine resources use and carrying capacity	Potential overexploitation of estuarine resources	Specific responsibility of Environmental Management and Signage Control	Part of mandate	Ongoing

PROPOSED ACTIVITY	ECOLOGICAL IMPACT/SOCIO-ECONOMIC CONSEQUENCES OF NO ACTION	EXPECTED AVAILABILITY OF HUMAN RESOURCES	ESTIMATED COST	EXPECTED DURATION
Maintain / formalise basic water quality monitoring programme, incorporating existing monitoring by all institutions (RNM, Ugu DM)	Unknown levels of pollution of systems, lack of knowledge of estuarine functioning Increased data collection to inform decision making. Limited appreciation of estuarine resources and attributes with resultant negative impacts on biodiversity, tourism, property and human health and safety	Specific responsibility of Environmental Management and Signage Control or by external service provider	Part of mandate Capital expenditure of R200 000 To be determined based on nature of monitoring agreed on	Once a month and after events/ incidents
Management Objective 6.4: Establish a system for reporting environmental non-compliance and other incidents of concern relating to the iKongeni estuary				
Ensure existing 'report and track incident' link on RNM website is operational and allows public reporting of non-compliance and pollution incidents (e.g., illegal dumping, sewage spills, gill netting etc.).	Lack of accountability for overexploitation, environmental degradation and severe pollution. Accumulation of waste to toxic levels with resultant negative impacts on biodiversity, tourism and human health	Specific responsibility of proposed estuarine co-ordinator	Part of mandate	Ongoing

6. SPATIAL ZONATION

Spatial zonation of activities within an EFZ is necessary to avoid user conflict and to guide sustainable utilization without degradation of the estuarine environment. It also allows for the spatial representation of the desired state and the aims of the management objectives, where applicable, and is informed by (DEA, 2015):

- The geographical boundary of the estuary also indicating important habitats (e.g., floodplain, open water, reed beds, sandflats, etc.);
- The surrounding land uses and existing infrastructure (RNM Town Planning Scheme, 2014);
- Areas designated for the conservation and protection of biodiversity;
- Appropriate buffers in which land use and development are strictly controlled and monitored; and
- Zones where certain types of activities (recreational, commercial, industrial, harvesting etc.) are permissible and others not permissible.

The spatial zonation applicable to the iKongeni EMP, which is detailed below, includes legislated development buffer zones, a Habitat Protection Zone, a Low Impact Recreation Zone and a High Impact Recreation Zone.

6.1. Spatially applicable legislative informants

The spatial zonation of the iKongeni EFZ is also informed by the National Environmental Management Act (Act No. 107 of 1998) (NEMA) EIA Regulations 2014 (EIA Regulations) as well as the ICM Act. These are detailed in Table 11.

Any proposed development, or modification to existing developments or land use zonation must comply with the EIA Regulations, any possible Spatial Planning and Land Use Management Act, Act No. 16 of 2013 (SPLUMA) controls, conditions of the anticipated CML, local building regulations, and / or any other legal instruments.

Table 11: Spatially applicable legislative informants (adapted from (DEA and Royal HaskoningDHV, 2017))

Legislation	Zone/Delineation	Description
ICM Act	Coastal Protection Zone (CPZ)	The CPZ consists of: • sensitive coastal areas[1]; • any part of the littoral active zone that is not coastal public property; • any coastal protected area, or part of such an area, which is not coastal public property; • any rural land unit that is situated within 1 km (1000 m) of the HWM which is zoned as agricultural or undetermined; • any urban land unit that is situated completely or partly within 100 m of the HWM; • any coastal wetland, lake, lagoon, dam or river which is situated completely or partially within a land unit situated within 1000 m of the HWM that was zoned for agricultural or undetermined use, or is within 100 m of the HWM in urban areas;

[1] as defined by the Environment Conservation Act (Act No. 73 of 1989, section 21)

		• any part of the seashore which is not coastal public property including all privately owned land below the HWM; • any Admiralty Reserve which is not coastal public property; and • any land adjacent to the above stated areas that would be inundated (submerged or covered) by a 1:100-year flood or storm event (this includes flooding caused by both rain storms and rough seas). The CPZ was established to manage and regulate the use of land that is adjacent to coastal public property (CPP), or that plays a significant role in coastal ecosystems. Current practice within South Africa is that the 10 m contour is the proxy for the CPZ extending inland and surrounding an estuary. Delineation of the CPZ provides for the protection of coastal properties and public safety, as well as for the protection of the coastal environment from dynamic coastal processes such as sea level rise, flooding and coastal erosion..
	Coastal Management Line (CML)	Coastal management lines (CML) are proposed to protect or preserve CPP such as beach amenities and other infrastructure such as parking; coastal private property such as private residences and business properties; public safety in the face of extreme weather and other natural events; the CPZ and the aesthetics or 'sense-of-place' of the coastal zone. The CML, once determined for KZN by EDTEA, must be incorporated into this spatial zonation. In the interim, the 5 m contour (i.e., the boundary of the current EFZ) is adopted as the proposed CML surrounding an estuary.
NEMA EIA Regs	5 m contour (Estuarine Functional Zone delineation)	The 5 m topographic contour encapsulates the current EFZ, which in turn is defined by the 2014 EIA Regulations (GNR 985) as "the area in and around an estuary which includes the open water area, estuarine habitat (such as sand and mudflats, rock and plant communities) and the surrounding floodplain area…". The 2013 and updated 2021 Protocol acknowledges the EFZ as the geographical boundaries of an estuary in South Africa. Further to the 5 m contour, recent studies indicate that the EFZ may be extended beyond the current 5 m contour, and the 10 m contour may be considered the new boundary of an estuary. Until this is formally approved, the 5 m contour remains the default estuarine boundary. The draft 2017 EFZ is illustrated in the delineation of the estuary for comparative purposes (Sourced from CoastKZN http://maps.coastkzn.co.za)[2].
	100 m from the High-Water Mark (HWM) of the sea and estuary	This area is a zone listed in terms of both the ICMA (in terms of the CPZ) and the EIA regulations (2014). In the EIA Regulations, this zone is identified and linked to various activities requiring prior environmental assessment and authorisation. A map of the estuary is provided indicating these contours in relation to the development cadastre. Imagery is sourced from CoastKZN (http://maps.coastkzn.co.za).
	32 m River and Wetland Development Buffer	The 32 m buffer from the edge/bank of all rivers, water bodies and wetlands/salt marshes, is intended to protect the ecological functioning of the riparian system. Any activities proposed within this area are also controlled by the EIA Regulations and the construction or expansion of facilities, irrespective of the increase in capacity or physical footprint, within this buffer, trigger a requirement to undertake an environmental assessment and obtain environmental authorisation before continuing. It is noted that on adoption of a CML relevant to the estuary, these lines take precedence. The inclusion of this development buffer will facilitate the protection of the sensitive vegetation along river banks from a terrestrial perspective. It is also proposed as a rehabilitation priority area where current development and other activities should be controlled, and damage caused mitigated or reversed. In such areas the priority is to discourage and control such activities and rehabilitate existing disturbed or transformed.

[2] ***** Caveat: Contour data for the spatial zonation was obtained from two sources, namely SANBI BGIS2 (5 m contour) and the Oceanographic Research Institute (ORI) (10 m contour). The latter is derived using detailed Lidar data and is more refined, however Lidar data for the 5 m contour was not made available at the time of compiling this EMP. Consequently, the spatial zonation maps of each estuary may need to updated to inform detailed land-use and development planning, pending the approval and adoption of the 10 m EFZ. *****

6.2. Current zonations and uses

Table 12 below lists the land use types and zonations as per the RNM Town Planning Scheme (TPS) (HCM, 2014) and activities occurring in and/or adjacent to the iKongeni estuary. According to the RNM TPS (HCM, 2014), the estuary body up to the R620 road bridge falls under a municipal Amenity Reserve, which is congruent with the Admiralty Reserve that traverses the upper beach zone. The estuary and critical dune cordon are thus afforded some protection in respect to development pressure.

For approximately 250 m upstream of the road bridge, the EFZ falls under private land ownership for residential and business purposes, whilst the uppermost reaches of the channel are zoned as Public Open Space.

Table 12: Current zonations and activities occurring in the iKongeni EFZ

LAND USE		
Purpose	**Zonation (RNM TPS)**	**Description**
Business	Low Impact Mixed Use 1	Various commercial enterprises including restaurants, retail outlets, public garages and service stations
Public use	Active Open Space, Public Open Space, Amenity Reserve, Worship	Designated open space for public use, this includes parking areas, bowling greens, the pedestrian bridge, lagoon feeder road and thus portions of the estuary
Residential / holiday accommodation	Residential High Impact 2, 3 and 4, Special zone 49 and 50	Predominantly holiday accommodation, including hotels and resorts, and residential establishments
Transport	Road reserve	Bridges: R620 coastal road, lagoon feeder road and numerous local access roads
Government use	Amenity Reserve	Public facilities related to infrastructure and services, i.e., sewage pump station
Estuary water body, Estuarine habitat, back- beach	Amenity Reserve, Admiralty Reserve, Public Open Space	The estuary water body, up to the R620 road bridge, the dune cordon along the ocean front, back-beach area abutting beach front amenities on Margate Main Beach
ACTIVITIES		
Fishing		Limited fishing, predominantly near the mouth
Boating		Non-motorised boating including recreational canoeing and paddle boating, mostly at the mouth during peak holiday periods
Swimming		Limited swimming associated with Margate Main Beach

6.3. Proposed Estuarine Spatial Zonation

6.3.1. Remainder of the Estuarine Functional Zone (Urban Zone)

As detailed in the accompanying SAR (Breetzke, Meyer and Kinvig, 2020) and section 8.3 below, the iKongeni estuary is an urban system with urban development almost fully transforming the EFZ. The system is impacted upon negatively by human activities and in turn impacts, both negatively and positively, on neighbouring developments. The proposed zoning of the remainder of the EFZ needs to take existing land use, existing zonation as well as existing land use controls in terms of the RNM town planning scheme (HCM, 2014) into consideration. Additional conditions of use are included in Table 13.

Table 13: Conditions of Use for the remainder of the iKongeni estuary EFZ (Urban Zone)

CONDITIONS OF USE	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY	ENFORCEMENT
Trimming of indigenous vegetation permitted. However, approval required for removal/complete clearing of stands of indigenous vegetation. No trimming or removal of protected tree species within the coastal dune cordon/Admiralty Zone or within estuarine habitats (e.g., swamp forest)	NFA, NEM:BA, TPS controls, Bylaws	DFFE, RNM	RNM, EDTEA
Removal/control of invasive alien vegetation	NEM:BA, CARA	RNM	DALRRD, DFFE
No further transformation or additional development or extension with the EFZ, resulting in loss/degradation of habitat	ICMA, NEMA	RNM	RNM
No discharge of contaminated and/or unattenuated stormwater runoff	TPS controls, NWA	RNM	RNM
No ad hoc erosion control or defence. Formal approval must be obtained	NWA, NEMA, ICMA	RNM, EDTEA	RNM
No further discharge of effluent/waste water into the estuary, (i.e., in addition to what is permitted)	NWA, ICMA	DWS, EDTEA	DWS
No dumping of solid waste or garden refuse in open areas, particularly along the estuary margins	NEMA	RNM	
Compliance with TPS controls, especially for Amenity/River Reserve	TPS controls	RNM	RNM
Contingency plans developed for those properties at risk of predicted and unforeseen events	TPS controls, NEMA	RNM, EDTEA	RNM, EDTEA

6.3.2. Habitat Protection Zone

Despite its highly modified and heavily urbanised state, the iKongeni estuary still supports *Phragmites* reed beds, swamp forest habitat and coastal dune and riparian forest, which provide valuable natural coastal habitat.

In this EMP, the following 'tools' in terms of the RNM TPS (HCM, 2014) are used to enact the proposed habitat protection zone:

- Amenity Reserve – the existing Amenity Reserve (including the Admiralty Reserve, as per the RNM TPS) and associated controls are supported by this EMP and must remain in place; and
- A proposed Non-User (NU) Conservation Reserve over private land – detailed below.

As stated in the RNM TPS (HCM, 2014, p. 7), "*the purpose of these reserves is to provide for the continuation, maintenance and expansion of public flood control facilities and areas as well as to accommodate dynamic coastal processes and natural coastal defences (vegetated dune cordon). Moreover, the purpose of these reserves includes: the conservation of the natural environment; the protection of the amenity; the prohibition of certain works and activities, including the restriction or limitation of access of and into such areas, reservations or zones*". While most RNM rivers (and by default the estuarine channel) are already zoned as River Reserve, the upper reaches of the iKongeni estuary are without such a reserve. A Non-User Conservation Reserve (overlay) over private property is thus proposed/recommended over the upper reaches of the EFZ, from the R620 up to the upstream boundary, to protect the quality of

the remaining natural environment, to minimise pollution and erosion, and ultimately reduce further degradation and transformation of this estuary and its EFZ.

It is also recommended that the Municipality consider rezoning the iKongeni River as River Reserve as per the existing portions of the river above the bridge, rather than Public Open Space for the purpose of "*conservation of the natural environment, the protection of the amenity, the prohibition of certain works and activities, including the restriction or limitation of access of and into such areas, reservations and zones*" (HCM, 2014, p. 7). Where the land is not state-owned, the Non-User Conservation Reserve (overlay) should be instated where development has not yet taken place. Conditions of use for this zone are detailed in Table 14.

Table 14: Conditions of Use for the Habitat Protection Zone in the iKongeni estuary

CONDITIONS OF USE	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY	ENFORCEMENT
No cutting/removal of indigenous vegetation for access, estuary views or security purposes	NEM:BA, TPS controls, Bylaws	DFFE, RNM	RNM, EDTEA
Removal/control of invasive alien vegetation	NEM:BA, CARA	RNM	DALRRD, DFFE
No further transformation or additional development or extension with the EFZ, resulting in loss/degradation of habitat	ICMA, NEMA	RNM	RNM
No discharge of contaminated and/or unattenuated stormwater runoff	TPS controls, NWA	RNM	RNM
No ad hoc erosion control or defence	NWA, NEMA, ICMA	RNM, EDTEA	RNM
No further discharge of effluent/waste water into the estuary, (i.e., in addition to what is permitted)	NWA, ICMA	DWS, EDTEA	DWS
No dumping of solid waste or garden refuse	NEMA	RNM	

All remaining wetland areas and natural vegetation beyond the water body but within the EFZ, must receive formal approval for modifications/removals, and specific provisions must be made for protected tree species (e.g., Red Coastal Milkwood *Mimusops caffra*, Powder-puff tree *Barringtonia racemosa*, etc.). Such conditions are provided for in the RNM TPS *(HCM, 2014, p. 78): "it will be the duty of the Municipality to ensure wherever it is considered appropriate, that adequate provision is made for the conservation of indigenous flora, the planting or replacement of trees and the protection of water-courses and other sensitive areas, by means of conditions qualifying the approval of the development. This clause does not replace any of the legislation governing the removal or translocation of flora and fauna as stated in Clause*."

6.3.3. Low Impact Recreation Zone

Low impact recreational use is permitted within the estuary water body (i.e., paddle-boating, canoeing and swimming - if the appropriate water quality standards are met), however, such activities are not permitted beyond the pedestrian bridge in order to reduce disturbance to the upstream estuarine habitats and residing bird species.

All recreational activities within the water body must provide for a 3- 5 m wide set-back (buffer) from the estuary shoreline. This provides for an aquatic buffer to minimise human disturbance to marginal estuarine habitats, i.e., activities must take place within the middle of the water body, avoiding the margins, emergent reeds and sandbanks, with a single consistent entry/exit point for paddle boaters / swimmers (e.g., on the beach).

This buffer must be considered a no-go zone for other activities (e.g., disposal of garden refuse, erecting of signage, instalment of rubbish bins), apart from approved structures, such as access roads, the pedestrian bridge, and an entry/exit point. The permissible activities within this aquatic buffer zone include removal of solid waste, clearing of invasive alien vegetation and rehabilitation activities, research and monitoring and rescue operations. Bait harvesting and fishing are permitted provided that a valid fishing permit can be produced. Conditions of use for this zone are detailed in Table 15.

A general Code of Conduct in respect to different low impact uses should apply. This Code of Conduct is detailed as follows:

- Bathers take priority (bathers have right of way) and must remain 3 - 5 m away from the banks;
- Boaters / canoeists must avoid bathers and must remain at least 3 - 5 m away from bathers as well as banks; and
- Boaters / canoeists must be considerate of fishermen's lines.

Table 15: Conditions of Use for the Low Impact Recreation Zone in the iKongeni estuary

CONDITIONS OF USE	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY	ENFORCEMENT
Only low impact activities such as non-motorised boating/canoeing/paddling, and swimming (3 - 5 m buffer applies)	Bylaws	RNM	RNM
No cutting/removal of indigenous vegetation for access, estuary views or security purposes	NEM:BA, TPS controls, Bylaws	DFFE, RNM	RNM, EDTEA
Removal/control of invasive alien vegetation	NEM:BA, CARA	RNM	DALRRD, DFFE
No further transformation or additional development or extension with the EFZ, resulting in loss/degradation of habitat	ICMA, NEMA	RNM	RNM
No discharge of contaminated and/or unattenuated stormwater runoff	TPS controls, NWA	RNM	RNM
No ad hoc construction of jetties or slip ways	NEMA	RNM, EDTEA	EDTEA
No ad hoc erosion control or defence	NWA, NEMA, ICMA	RNM, EDTEA	RNM
No artificial breaching of estuaries without an approved Mouth Management and Maintenance Management Plan	NEMA	RNM	EDTEA
No discharge of effluent/waste water into the estuary	NWA, ICMA	DWS, EDTEA	DWS
No dumping of solid waste or garden refuse	NEMA	RNM	RNM

6.3.4. High Impact Recreation Zone

The area within the EFZ with high tourism pressure is designated as a High Impact Recreation Zone. This area includes the sand berm of the iKongeni estuary south of Club Zuri, which forms part of Margate Main Beach. This area is to be well managed, particularly during peak holiday seasons when tourism and recreational activities are highest. The responsible authorities will be required to be present or active during these periods. For example, the RNM Aquatic Health and Safety department must appoint beach officials/managers to direct recreational activities, deploy teams to undertake effective waste collection/management, as well as additional life guards to monitor this area specifically. Conditions of use for this zone are detailed in Table 16.

Importantly, high impact recreational activities are not permitted within the core estuarine area, that is, the main waterbody and marginal vegetation between the old training wall at Club Zuri (30°51'37.17"S, 30°22'21.36"E) and the southernmost point of the Amenity (Admiralty) Reserve/EFZ on the northern bank that incorporates the dune cordon (30°51'36.35"S, 30°22'23.76"E). This is to ensure that there is no additional disturbance to, and degradation of, the remaining estuarine habitat.

Table 16: Conditions of Use for the High Impact Recreation Zone in the iKongeni estuary

CONDITIONS OF USE	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY	ENFORCEMENT
Only low impact activities such as non-motorised boating/canoeing/paddling, and swimming (5 m buffer applies)	Bylaws	RNM	RNM
No cutting/removal of indigenous vegetation for access, estuary views or security purposes	NEM:BA, TPS controls, Bylaws	DFFE, RNM	RNM, EDTEA
Removal/control of invasive alien vegetation	NEM:BA, CARA	RNM	DALRRD, DFFE
No further transformation or additional development or extension with the EFZ, resulting in loss/degradation of habitat	ICMA, NEMA	RNM	RNM
No discharge of contaminated and/or unattenuated stormwater runoff	TPS controls, NWA	RNM	RNM
No ad hoc construction of jetties or slip ways	NEMA	RNM, EDTEA	EDTEA
No ad hoc erosion control or defence	NWA, NEMA, ICMA	RNM, EDTEA	RNM
No artificial breaching of estuaries without an approved Mouth Management and Maintenance Management Plan	NEMA	RNM	EDTEA
No discharge of effluent/waste water into the estuary	NWA, ICMA	DWS, EDTEA	DWS
No dumping of solid waste or garden refuse	NEMA	RNM	RNM



Figure 4: Spatial zonation of the iKongeni estuary

6.4. Areas for Rehabilitation

Priority rehabilitation of the iKongeni estuary relates predominantly to curtailing sewage spills and surcharges within the system. The required activities are specifically addressed in the action plan under Management Priority 1.1. Specific areas identified for rehabilitation, in addition and as detailed in the actions plan under various other management priorities, are detailed as follows:

- This system also urgently requires the removal of accumulated litter and dumped solid waste from the estuary channel (e.g., car tyres, building materials, plastic and glass bottles, etc.). This should be undertaken through a formalised municipal waste management programme or the EPWP Sihlanzimvelo Project on a monthly basis, with large clean up events scheduled for post-peak holiday season and following major rainfall or flood events. As much as possible of the collected waste must be recycled;
- Invasive alien vegetation removal is also required within the estuary, EFZ and at a broader catchment level. This must be undertaken by a registered service provider, with experience in the invasive species control around water bodies, specifically the application of appropriate herbicides;
- The existing rock revetments and/or gabion baskets defending the northern banks of the estuary, specifically adjacent to the pedestrian bridge (Figure 5 A), need to be repaired and maintained to prevent further degradation and subsequent damage to infrastructure and the environment. Ongoing maintenance is required for all erosion defence interventions (e.g., protection of beach amenities on Margate Main Beach), as and when required;
- Areas previously damaged by flooding, vulnerable to erosion and/or where inappropriate defence interventions have been implemented, must be rehabilitated to prevent further degradation. Specific areas requiring attention are the seaward section of the R620 southern abutment where litter has accumulated and infrastructure has and continues to be undermined by flood waters (Figure 5 B); and the southern bank approximately 180m upstream of the R620 road bridge that was undermined by recent flooding and land reclamation has subsequently taken place (Figure 5 C). Importantly, all interventions must be legally compliant (i.e., NEMA, NWA, ICM Act) irrespective of private or state land ownership, and land owners should be directly engaged by the Municipality in respect to environmental best practice and legal requirements;
- Rehabilitation of the estuarine margin and dune cordon by private land owners must be encouraged where there has been active removal of marginal/riparian vegetation. Ground-truthing of these areas is required to advise on appropriate interventions, species for planting, etc. *Ad hoc* access paths created through the dune cordon to the north of the estuary mouth should be closed in favour of consolidating and formalising (e.g. boarded) current informal access paths through coastal public property to prevent damage to the vegetation (SSI, 2011). The informal paths should be revegetated to strengthen the integrity of the natural coastal defence; and
- The open area immediately upstream of the R620 road bridge presents an opportunity to reinstate a vegetated riparian corridor. However, this area exhibits symptoms of hydrological instability and erosion. Photographic evidence as well as anecdotal reports indicate that this area is a flooding pinch point during high rainfall events. A hydrological study is needed to assess the current flows and capacity of the existing infrastructure and river channel to deal with peak flows. Once this information has been obtained, only then can both infrastructure replacement/refurbishment and/or redesign/reinstatement and suitable riparian/wetland rehabilitation be implemented to improve the habitat quality and ecosystem services provision of the upper estuary.



Figure 5: A) Failing rock revetment on the northern bank adjacent to the pedestrian bridge; B) Erosion and undermining on seaward side of the R620 southern abutment, C) Land reclamation following undermining of private property by flooding

7. INSTITUTIONAL CAPACITY AND ARRANGEMENTS[3]

This EMP is a strategic plan guiding the implementation of actions in respect to each management priority. The management priorities do not specify the required resources (both human and financial) required for the execution of the specific actions.

7.1. Responsible Management Authority

The NEMP[4] identifies the RNM as the RMA currently legally accountable for the development of EMPs within its area of jurisdiction, as well as being responsible for the co-ordination of their implementation. Specific implementation actions identified remain the responsibility of mandated government agencies as well as respective departments within the RNM. As an example, the DWS will monitor water quality, while the DFFE will ensure compliance with matters related to fisheries.

The draft Hibiscus Coast CMP (Nzingwe Consultancy 2016), notes that the Municipality does not have the capacity, resources (human and financial) or knowledge necessary to fulfil their coastal and estuarine management role and that management actions occur on a reactionary basis when the need arises and are often uncoordinated and addressed using only available human and financial resources. The capacity of the RNM has not since improved, however, effective implementation of this EMP does require the augmentation of capacity specifically within the Development Planning Services Department, with the recommended long -term appointment of an **estuarine management co-ordinator** (EMC) reporting to the Manager: Environmental Management and Signage Control. Alternatively, this co-ordinating role can be undertaken by the EDTEA Ugu Regional Office or the Ugu DM. Regardless of where this individual is located, they will play a critical co-ordinating role for all other implementing agencies and RNM departments. This function will be undertaken by the Ugu DM in the interim[5].

Other RNM departments responsible for specific actions include:

- Development Planning Services (environmental management, town planning, building control and local economic development);
- Community Services (aquatic safety, waste minimisations, arts and culture);
- Strategic Planning and Governance (inclusion of actions within performance monitoring and evaluation and consideration of management objectives within strategic planning);
- Public safety (health and safety and emergency response); and
- Technical services (stormwater runoff into estuaries, management of human settlements and well as human activities).

Progress towards achieving the objectives set out in this EMP must be reviewed on an annual basis and communicated to stakeholders as well as to DFFE via an annual report. This EMP must be revisited and updated after five years to reflect goals that have been achieved and changing priorities.

[3] It should be noted that this section has been moved prior to management priorities to provide context

[4] The Abbott Judgement, which questions the constitutionality of the assignments made in the Protocol, is noted. Until such time as the Protocol is amended, the Ray Nkonyeni Municipality is deemed as the Responsible Management Authority.

[5] Minutes of the 2nd authorities meeting held on the 28th of January 2021

7.2.Estuary Advisory Forum

The establishment of an estuary advisory forum (EAF) per estuary is no longer a requirement of the NEMP. Private entities and non-government organisations can still play a supporting role in the implementation of this EMP through the Ugu DM MCC Estuarine Sub-committee, established to consider estuarine management in the Ugu District as a whole. Estuarine issues should also be included as standard item on the agenda of the current Municipal Environmental Committee, the Ugu DM MCC as well as the KZN PCC. Both technical and management support should be provided by the KZN lead agency, the EDTEA, RNM, as well as the Ugu DM, in support of this process.

7.3.Government Departments and Organs of State

The key to successful implementation of this EMP is the commitment and contribution of all spheres of government to the process, including:

- Ray Nkonyeni Municipality: as the identified RMA;
- Ugu District Municipality: Responsible for issues relating to water and sanitation, disaster management, the provision of management and technical support and the interim hosting of the estuarine coordination function;
- KwaZulu-Natal Government departments: Responsible for legislatively mandated responsibilities as well as support, including compliance, funding, research and monitoring (e.g., EDTEA, Cooperative Governance and Traditional Affairs (COGTA), and Department of Agriculture and Rural Development (DARD);
- Relevant National government departments, especially DFFE, DWS via the regional office, Department of Rural Development and Land Reform (DRDLR); and Department of Science and Technology (DST); and
- Organs of State: Umgeni Water, Ezemvelo KZN Wildlife, Oceanographic Research Institute, Council for Scientific and Industrial Research, and Natal Sharks Board.

The DFFE is responsible for national standardisation of estuarine management and approval of provincially-compiled estuarine management plans. Direct involvement in individual estuaries will occur via existing forums for intergovernmental coordination. These forums will have estuarine management on their agendas, and include:

- The Ugu Municipal Coastal Committee (MCC): Responsible for facilitating co-management, effective governance and district level co-ordination of coastal and estuarine management issues; and
- The KZN Provincial Coastal Committee (PCC): Estuaries sub-committee: Responsible for facilitating co-management, effective governance and provincial level co-ordination of coastal and estuarine management issues.

7.4. Other Key Role Players

Both co-management and effective governance have already been identified as the keystones to the efficient and effective management of estuaries within the RNM Area.

The following functional environmental structures/ forums should also be integrated into the EMP:

- Invasive Alien Forum;
- Working for the Coast Forum;
- Environmental Education and Awareness Forum;
- Waste Management Forum;
- NGOs such as Coastwatch and WESSA;
- KZN Wildlife and Environment Working Group;
- South Coast Tourism;
- Alien plant working groups, run by the EDTEA, RNM and Ugu DM;
- The iKongeni River Conservancy;
- The Margate Ratepayers Association;
- The Margate Business Association;
- Local business owners and tourism operators; and
- Local developers and industries.

7.5. Project Plans for Implementation

Effective implementation of this EMP requires the conversion of the priority actions into detailed project plans, which must be prepared and adopted into the respective departmental implementation strategies.

A template for such project plans is provided in the EMP Development Guideline (DEA, 2015) and is attached in the Appendix A for ease of reference. This template can also be utilised to facilitate the implementation of other projects proposed in the EMP, e.g., the development of a SOP (contingency plan) for response in respect to emergency events (e.g., pollution spills) and an early warning system.

8. MANAGEMENT PRIORITIES

The following aspects were refined as the management priorities for the iKongeni estuary.

8.1. Estuarine Health and Function

As detailed earlier in this EMP and in the accompanying SAR (Breetzke, Meyer and Kinvig, 2020), the iKongeni estuary is a highly transformed, severely modified and degraded system located in a heavily urbanised catchment with very high levels of cumulative pressures and impacts. The desired state for the system is set at largely modified due to its transformed nature with management interventions needing to prevent further ecological degradation of the system. Key interventions proposed and included as management priorities in respect to ecosystem health and functioning include improving water quality by reducing the amount of sewage inflows, minimising pollution, restoring estuarine habitat and management of the mouth state. All effort should be made to ensure that the system does not continue to be a health hazard.

Table 17: Management Priorities for Estuarine Health and Function

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
Management Priority 1.1: Secure adequate quantity and quality of freshwater input to improve and maintain ecosystem health and functioning by specifically preventing sewage inflows				
i. Implement gazetted estuary and river water resource classification outputs (REC, RQOs, etc)	NWA	• Meetings held between Ugu DM Water Resource Management and Sanitation Services • Minimum health class of D adopted • Outputs incorporated into Water Services and Sanitation Master Plans	**HIGH**	DWS, Ugu DM
ii. Undertake a hydrological study on the iKongeni River and downstream/flooding implications	ICMA, MSA	• Budget secured • Hydrological study undertaken	**HIGH**	Ugu DM
iii. Ensure that the Margate WWTW is operating according to design specifications and an approved Water Use licence (WUL) and Coastal Waters Discharge Permit (CWDP), with a maintenance and operations plan in place	NWA, ICMA	• WUL and CWDP process urgently completed • Operation is compliant with WUL and CWDP • Upgrades / improvements undertaken and implementation fast tracked • Regular maintenance undertaken • Penalties issued for non-compliance • Improved treatment of waste water and operation of the WWTW • Reduced malfunctions, and pollution incidents in river and estuary	**HIGH**	DWS, DFFE, Ugu DM

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
iv. Investigate means to reduce/reuse the amount of wastewater discharged to the river from the WWTW in light of increasing development pressure	NWA, ICMA	• Meetings held between Ugu water resource management and sanitation services • Innovative plans to reduce/reuse tabled and feasibility study undertaken • Outputs incorporated into Water Services and Sanitation Master Plans	**HIGH**	Ugu DM
v. Undertake necessary repairs, upgrades and expansions for sewage infrastructure (as planned in the WSMP)	MSA, NWA	• Repairs, upgrades or expansions undertaken and implementation fast tracked	**HIGH**	Ugu DM
vi. Develop and implement catchment management and rehabilitation plan for Hunters Stream to curb stormwater issues, sewage leaks and contamination	MSA, NWA, ICMA	• Sources of water quality issues along the stream investigated and identified • Workshop of with relevant municipal departments • Landowners/business owners engaged • Ablution facilities upgraded/maintained • Reduced bacterial loads in Hunters Stream and along Margate Beach	**MEDIUM**	Ugu DM
Management Priority 1.2: Minimise other forms of pollution by identifying and addressing activities that lead to poor water quality				
i. Develop, implement and ensure compliance with a pollution mitigation plan (in response to confirmed sources and types of pollution) which includes generic best practice actions applicable for Petrol filling stations, car wash facilities and other commercial/industrial enterprises as well as land owners	ICMA, NWA, MSA, SPLUMA	• Inventory of sources and types of pollution compiled and associated contributors identified • Appropriate interventions identified and prioritised (e.g., litter traps/socks on stormwater outlets, dedicated weekly clean ups, only clean stormwater run-off into the estuary, installation of necessary traps, frequent maintenance checks of storage facilities and/or specifically hazardous substances, effective flood protection measures) • Engagement and mitigation strategies discussed with contributors • Interventions implemented • Improvement in water quality and general estuarine health and appearance • Improved stormwater management systems in place – as per proposed RNM stormwater master plan • Well maintained storage facilities • Reduced spillages and water quality incidents in estuary • No pollution resulting after flooding and high rainfall	**HIGH**	RNM, Ugu DM, EDTEA, DFFE

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
ii. Review, adopt and implement the draft standard operating procedure (SOP) developed for response irt emergency events (sewage spills, petrol spills, etc.)	MSA, NWA, ICMA, DMA	• Draft SOP reviewed at Authorities workshop (**URGENT ACTION**) • SOP approved and implemented • SOP updated as and when required • Pollution reports investigated • Offenders identified and prosecuted • Environmental impacts reduced • Public health and safety risks reduced • Repairs, upgrades or expansions undertaken and implementation fast tracked	**HIGH**	RNM, Ugu DM, EDTEA
iii. Include monitoring of stormwater management systems to reduce blockages (including illegal connections/disposal to sewer) and facilitate the use of applicable sustainable urban drainage systems (SUDS) *(cross cutting action, see management priority 3.2 below)* in the proposed RNM stormwater management master plan	MSA	• RNM stormwater master plan completed and includes iKongeni estuary • Service provider(s) appointed to patrol municipal area • Patrols undertaken • Blocked systems reported • Clean-ups undertaken • Sources/reasons of blockage investigated and identified • Illegal abstractions and discharges terminated • Transgressors prosecuted • Applicable SUDS discussed and confirmed	**HIGH**	RNM
iv. Continue to support the Sihlanzimvelo Stream Cleaning Project	NWA	• Continued implementation of the Sihlanzimbelo Stream Cleaning Project • Tonnes and types of solid waste removed • Number of participants recorded • Improvement in water quality and general estuarine health and appearance	**MEDIUM**	RNM, DEA: WftC
v. Participate in 'Adopt-a-river' / 'Adopt-a-stretch' programme to facilitate river stewardship	NWA	• Investigation of inclusion of the iKongeni River and estuary in the 'Adopt-a-River' programme • Number of participants recorded • Improvement in water quality and general estuarine health and appearance	**MEDIUM**	RNM, Ugu DM, EDTEA, DWS
vi. Erect 'No dumping' signs along the estuary margins	MSA, NEM: WA	• Signage developed • Signage installed	**MEDIUM**	RNM

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
Management Priority 1.3: Rehabilitate degraded areas				
i. Margate WWTW operator / Ugu DM to invest in river and estuarine rehabilitation (contingency funding) in the event of spillages or infrastructure failure	NEMA, NWA, ICMA	• Funding set aside for river/estuary rehabilitation • Environmental impacts reduced • Public health and safety risks reduced • Estuary recovery expedited	**HIGH**	Ugu DM
ii. Develop and implement rehabilitation plan (with ongoing maintenance of rehabilitated areas)	NEM:BA, NWA, CARA, NFA	• Rehabilitation plan developed • Priority degraded areas repaired/ restored (taking NEMA / NWA into account) • Annual review of rehabilitated areas for ongoing maintenance	**HIGH**	RNM
iii. Lobby for landowners and respective companies to rectify damages/ degraded areas on their property	NEM:BA, NWA, CARA	• On-going relationship with landowners developed • Degraded areas restored (e.g., planting of estuarine vegetation and rehabilitation of estuarine margin and dune cordon undertaken) • Repair/replacement of failing estuarine defence (e.g., existing rock revetment and/or gabion baskets defending the northern banks of the estuary) • Ongoing maintenance of all erosion defence interventions	**HIGH**	EDTEA, I&APs, identified landowners
Management Priority 1.5: Ensure effective mouth management that enables maximum tourism benefits while maintaining adequate estuarine functioning				
i. Artificial breaching undertaken in accordance with the updated Mouth / Maintenance Management Plan	NEMA, ICMA, NEMP	• Mouth / Maintenance Management Plan implemented • Sensitive breaching practices adopted	**HIGH**	RNM
ii. Negotiate feasibility of preferred RNM option, namely, permanent sub-terrain groyne to relocate the estuary mouth and undertake formal impact assessment (if supported by EDTEA)	NEMA, ICMA	• Bilateral between EDTEA and RNM held • Agreement reached with EDTEA to undertake assessment • Capital budget confirmed • Service provider appointed • Impact Assessment undertaken • Authorisation obtained and successful alternative implemented	**MEDIUM**	RNM, EDTEA

8.2.Conservation

While the iKongeni estuary does not contain areas deemed worthy of formal conservation, the remaining estuarine habitats should nonetheless be preserved to continue to provide habitat for estuarine organisms and contribute to ecosystem functioning. This is provided for within designated habitat protection zones in the spatial zonation plan. Riparian stewardship or 'duty of care' should be strongly encouraged for all adjacent property owners with appropriate signage instated at strategic locations. Effort should be made to control the spread and densification of both aquatic and terrestrial invasive alien plant species and sustainable resource use ensured.

Table 18: Management Priorities for Conservation

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
Management Priority 2.1: Ensure the conservation of remaining estuarine habitats				
i. Establish a riverine/wetland conservation servitude overlay zone in the TPS, thereby extending the riverine reserve to encapsulate the upper reaches of the estuary, and upper river and drainage lines of the catchment	NWA, MSA, SPLUMA	• Extended riverine reserve and riverine/wetland conservation servitude indicated in TPS • Management controls developed • Landowners notified of overlay zone(s) (and associated restrictions contained in the management controls)	**HIGH**	RNM
ii. Adopt and implement spatial zonation plan (habitat protection of estuarine habitats, dune cordon and riparian forest)	ICMA, NEMP	• Reduced habitat loss/degradation • Improvement general estuarine health and appearance [6]	**HIGH**	RNM
iii. Update existing environmental bylaws or develop estuarine specific bylaws to support iKongeni estuary spatial zonation plan and its controls	ICMA, NEMP, MSA	• Bylaws updated (or developed) and gazetted	**HIGH**	RNM
iv. Engage with land owners and stakeholders (i.t.o. adopt-a-stretch / river stewardship agreements etc.)	NEM: PAA, MSA, SPLUMA	• Participation of land owners and stakeholders in preservation of iKongeni estuary • Improvement general estuarine health and appearance	**HIGH**	RNM
v. Instate educational signage at strategic locations to promote environmental stewardship, duty of care and preservation	ICMA, NEMP, MSA	• Approval and funding obtained • Signage created and erected in key public spaces and main access routes • Signage maintained	**MEDIUM**	RNM

[6] Likely only with improved water quality conditions

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
Management Priority 2.2: Control the spread and densification of both aquatic and terrestrial invasive alien plant species				
i. Ensure the inclusion of iKongeni estuary in the RNM invasive species eradication and maintenance programme	CARA, NEM:BA	• IAPs eradication programme implemented by a registered service provider • Increased area of IAPs removed	**MEDIUM**	RNM, DEA: WftC, WfW, DFFE
ii. Prioritise areas along the estuary followed by key areas in the catchment (e.g., adjacent to/in wetlands and CBA)	CARA, NEM:BA	• Priority areas identified • Priority areas included in RNM invasive species eradication and maintenance programme	**MEDIUM**	RNM, DFFE, KZN DARD
Management Priority 2.3: Ensure sustainable resource use through an effective level of compliance management				
i. Adopt and implement spatial zonation plan using signage/markers	MSA, ICMA, NEMP, MLRA, NWA	• Designated preservation zones demarcated and enforced (in respect to planning controls)	**HIGH**	RNM, RMA
ii. Enforce compliance with spatial zonation plan, controls and associated by-laws governing human activities (i.e., use of living resources, habitat preservation, recreational activities)	MSA, ICMA, NEMP, MLRA, NWA	• Monitoring and reporting by conservancy members (Watch-dog) • Increased compliance monitoring during peak holiday season • Findings documented and reported on	**HIGH**	RNM, DFFE, Margate Conservancy

8.3. Land-use and Infrastructure Planning and Development

The iKongeni estuary is an urban system with urban development located within the designated EFZ (and proposed 10 m asml EFZ) as well as on both banks. The system is impacted upon negatively by human activities and in turn impacts, both negatively and positively, on neighbouring developments. As such, and in response to the potential impacts of climate change, any new development or change in existing development (redesign/reinstatement) should be sited and constructed to reduce risk and should preferably be located above the 1:100-year flood line. It should also be innovative in design (e.g., adaptable buildings, re-locatable buildings, flood-proofed buildings, flood resistant and resilient construction etc.) and not increase risk elsewhere. Infrastructure currently located within the EFZ should have contingency plans developed, in anticipation of predicted and unforeseen events, and should include likely impacts and proposed responses, particularly with respect to the failure/malfunction of sewage infrastructure. Additional special planning regulations or coastal by-laws, in terms of style and sustainability, can also be identified and implemented as a precautionary measure in reducing the potential impacts of climate change.

The ICMA provides for the KZN EDTEA, in consultation with RNM, to designate coastal management lines (CML). It is anticipated that such line(s) will relate closely to the EFZ and will formalise development control and set-back from these sensitive ecosystems and protect lives, property and future development from flooding, predicted sea level rise and other extreme weather events.

Table 19: Management Priorities for Land-use and Infrastructure Planning and Development

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
Management Priority 3.1: Ensure the effective implementation of this EMP				
i. Ensure the incorporation of this EMP into the IDP and SDF	ICMA, NEMP, MSA, SPLUMA	• EMP approved • Objectives, management objectives and activities included in IDP as part of cyclical review	**HIGH**	RNM
ii. Ensure that estuary spatial zonation and land use controls are reflected in SDF and LUMS (during review cycle)	ICMA, NEMP, MSA, SPLUMA	• EMP approved • Zonation included in SDF and LUMS as part of cyclical review	**HIGH**	RNM
Management Priority 3.2: Minimise the potential impacts of climate change				
i. Determine and designate Coastal Management Line (CML)	ICMA	• Sea level rise implications and coastal risk determined • Consultation undertaken • CML lines designated • CML lines incorporated into SDF and LUMS	**HIGH**	EDTEA, RNM
ii. Specific engagement with property owners who own property within the EFZ / seaward of the CML in respect to potential risk and responses/interventions	ICMA, MSA	• Sea level rise implications and coastal risk determined • Engagement with property owners RE risks and appropriate interventions • Contingency plans developed for infrastructure at risk • Gradual retreat option investigated and to inform proposed contingency plans	**MEDIUM**	EDTEA, RMA
iii. Ensure that the proposed RNM Stormwater Management Master Plan investigates opportunities for the instalment of SUDS and ecological infrastructure (EI) in the catchment ('on site') and potentially along the estuary to regulate stormwater run-off and inputs and alleviate downstream flood risk	MSA, NWA, ICMA	• SUDS/EI investigation included in proposed RNM Stormwater Management Master Plan • 1-day training for officials convened and attended • SUDS applied by building control and technical services • EI preserved and/or enhanced	**MEDIUM**	RNM
Management Priority 3.3: Facilitate and manage the sustainable utilisation and development of the areas within the Estuarine Functional Zone				
i. Ensure that all proposed developments adhere to the full suite of relevant environmental legislation, taking the downstream estuarine environment into account	NEMA, NWA, NEM:BA NEM: PAA, NHA	• Inspections undertaken • New developments are compliant	**HIGH**	EDTEA, RNM

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
ii. Undertake strict compliance monitoring for new structures being built and following natural disasters (floods, coastal erosion events)	MSA	• Inspections undertaken • Transgressors prosecuted • Corrective action undertaken	**MEDIUM**	EDTEA, RNM
iii. Encourage environmentally sensitive developments/developers and maintain sound / innovative building techniques	MSA, NWA, ICMA, SPLUMA, NEMA	• Land use control decisions influenced (e.g., appropriate development only in disturbed areas of EFZ, implement SUDS, energy efficient and water wise, prevent removal of indigenous vegetation etc.) • No further loss of indigenous vegetation and habitat • Stormwater regulated on-site	**MEDIUM**	RNM, EDTEA
iv. Lobby existing developments and businesses to modify current behaviour and practises and implement environmental best practises (e.g., rainwater harvesting, waste management and sewage blockages)	MSA, NWA, ICMA, SPLUMA, NEMA	• Communication programme initiated • Ongoing liaison with property owners in high-risk areas	**MEDIUM**	RNM

8.4. Institutional and Management Structures

Co-operative governance is the linchpin to realising the key objectives and thus ultimately achieving the vision for the iKongeni estuary. Without well-structured and efficient institutional and management arrangements, actions taken could be no more than a series of uncoordinated reactions to immediate problems. Essential to the successful implementation of this EMP, is the coordination of the management responsibilities by the RMA. Given the large number of estuaries in the municipal area, this may best be achieved through a designated estuarine (and coastal) management function within the RNM, Ugu DM, or EDTEA but ultimately within the RMA, through which all estuarine management interventions are administered. Coordination is a pivotal role in rallying the participation and input of the relevant government departments and institutions to undertake their responsibilities, according to their legislated mandates. Facilitating and maintaining effective communication between these role players as well as civil society is thus essential. In addition, co-operative governance is required for identifying, lobbying, and promulgating appropriate by-laws and/or amendments to existing by-laws of the RNM in support of estuarine management (e.g., implementation of the estuary spatial zonation). As an interim measure, this coordination function will be located within the existing Ugu DM environment management section, as proposed at the 2nd authorities meeting held on the 28th of January 2021. The most suitable location of the proposed estuarine management co-ordinator should be investigated and motivated for via the correct channels and methods i.e., undertaking the necessary restructuring.

The recommended management actions cannot be undertaken without appropriate funding. Each participating institution will be required to source funding for their respective mandated responsibilities from within their respective operational budgets. Additional means of obtaining funding does exist, for example, by motivating for funding via the Environmental Protection and Infrastructure Programme (EPIP).

Table 20: Management Priorities for Institutional and Management Structures

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN PRIORITY	WORK PLAN RESPONSIBILITY
Management Priority 4.1: Ensure effective co-ordination of estuarine management responsibilities				
i. Ensure that the Ugu DM provide an effective means of co-ordinating estuarine management activities within the district	ICMA, NEMP	• Estuarine management coordination function undertaken by Ugu DM • EMC appointed in the long term after investigation of most appropriate sphere of government location	**HIGH**	RNM / Ugu DM
ii. Monitor and report on the progress of EMP actions and achievements	ICMA, NEMP	• Biannual and annual reporting undertaken	**HIGH**	RNM / Ugu DM
iii. Individual agencies to identify and address training needs among staff involved in estuarine management (RNM, Ugu, DWS, DFFE (e.g., for monitoring, visitor regulation and assistance, etc)	ICMA, NEMP	• Official(s) attend accredited estuarine management course	**MEDIUM**	RNM / Ugu DM
iv. Ugu DM to chair the Ugu DM Estuarine Sub-committee meetings *(See 4.2 ii)*	ICMA, NEMP	• Ugu Estuarine Sub-committee meetings chaired by Ugu DM	**HIGH**	Ugu DM
v. Develop and maintain estuaries information repository and database	ICMA, NEMP	• Critical data and information collected and managed	**MEDIUM**	RNM / Ugu DM
vi. Establish and manage a voluntary community monitoring team as well as data collected	NWA, ICMA, NWA	• Voluntary team established and effectively organised • Voluntary team mobilised as and when needed • Results of monitoring collated and documented	**MEDIUM**	RNM and participating institutions (e.g., Margate Conservancy, WESSA, Ezemvelo)
vii. Update environmental by-laws to include key estuarine issues (e.g., clearance of vegetation for views, preservation of estuarine habitat, interference with estuarine mouth, permissible/non permissible uses/activities i.r.t. to spatial zonation, e.g., boating)	MSA, ICMA, NEMP	• Bylaws updated and published in local gazette • Bylaws adopted	**MEDIUM**	RNM

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
Management Priority 4.2: Define co-operative governance arrangements for the iKongeni estuary				
i. RNM / Ugu DM to obtain agreement from government departments and other participating agencies in respect of their roles and responsibilities in estuarine management	ICMA, NEMP, MSA, SPLUMA, NWA, NEM: PAA, MPRDA, NFA	• MOUs signed (or applicable agreements reached) between RMA and spheres of government and participating agencies	**HIGH**	Ugu DM / RNM
ii. Establish the recommended Ugu MCC estuarine sub-committee, chaired by the Ugu DM or RMA (representative members of government and stakeholders to be members)		• Ugu Estuarine Sub-committee constituted (Membership includes representatives of government and stakeholders/civil society)	**HIGH**	Ugu DM
iii. Convene quarterly meetings to address estuarine matters and discuss progress on management actions	ICMA, NEMP, MSA	• Ugu Estuarine Sub-committee meets on a quarterly basis • Meetings are minuted • Active collaboration of various institutions, private and civil stakeholders	**HIGH**	Ugu DM / RNM and participating institutions & stakeholders
iv. Maintain a stakeholder database for the dissemination of information	ICMA, NEMP, MSA	• Stakeholder database developed and regularly updated	**MEDIUM**	RNM
v. Ugu Estuarine Sub-committee contributes to 5-year review of EMPs	ICMA, NEMP, MSA, SPLUMA, NWA, NEM: PAA, MRPDA, NFA	• EMP is formally reviewed every 5 years by key institutions, govt depts. and stakeholders	**MEDIUM**	Ugu DM
vi. Ugu Estuarine Sub-committee to be represented at Pongola-Umzimkulu CMA forum to ensure that estuarine matters are tabled	NWA	• Ugu Estuarine Sub-committee attendance at CMA forum meetings • CMA addresses downstream issues relating to estuaries	**HIGH**	EAF
Management Priority 4.3: Secure financing for estuarine management initiatives				
i. Individual government agencies to make provision for the necessary resources in the short, medium and long-term expenditure frameworks to create and fill posts, and acquire necessary infrastructure and resources for effective management of RNM estuaries	ICMA, NEMP, MSA, SPLUMA, NWA, MRPDA, MFMA, PFMA, NFA	• Funds secured for 5 years • An action plan for securing future funding drafted and approved	**HIGH**	RNM and Participating institutions
ii. Individual government agencies to develop long-term financing plans				

8.5. Socio-Economic Considerations

Tourism is one of the main economic drivers for the RNM. Much of this is dependent on as well as along the coastline and around estuaries. The ancillary supporting services, including holiday accommodation, restaurants and food-outlets, recreational activities (e.g., canoe and beach umbrella hire, craft sales etc.) and even transport facilities, all provide employment to residents as well as poorer communities, particularly around peak holiday periods. These activities can therefore be viewed as both 'green and blue economy' activities. All effort should be made to ensure the current ecotourism related activities located within the iKongeni EFZ continue to provide livelihood opportunities through supporting existing business opportunities, current work opportunities and potential job creation related to synergistic activities. To ensure the return of visitors to the RNM coastline as a whole and specifically the iKongeni EFZ, visitors must be assured of a safe, clean, and attractive coastal environment that is easily accessible to all who wish to enjoy its beauty and benefits. However, the health of the iKongeni estuary should not be jeopardised by the influx of tourists and thus recreational activities in and around the estuarine environment must be regulated to prevent the degradation and misuse of the system.

Table 21: Management Priorities for Socio-Economic Considerations

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
Management Priority 5.1: Maintain safe, clean, equitable and controlled access				
i. Maintain and control the current access to the Margate Main Beach and iKongeni estuary margins	ICMA, MSA	• Budget allocated for on-going maintenance • Scheduled maintenance programme to maintain beach facilities and infrastructure in place • Specific issues related to the iKongeni estuary included in annual RNM Peak Season Maintenance Plan (e.g., increased waste management, increase signage not to breach estuary etc.)	**HIGH**	RNM
Management Priority 5.2: Regulate recreational use in and around the iKongeni estuary[7]				
i. Adopt, demarcate and enforce the spatial zonation plan (SZP) (i.e., habitat protection)	ICMA, NEMP, MSA	• SZP incorporated into SDF and LUMS • SZP demarcated with markers/signage if necessary • SZP controls enforced according to bylaws and offenders prosecuted • Environmental (Estuarine) bylaws to include specific clauses which regulate high impact recreational activities in the estuary • Reduced habitat loss/degradation • Improvement general estuarine health and appearance	**HIGH**	RNM

[7] Cross cutting with Conservation

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
ii. Instate educational signage at strategic locations to promote environmental awareness, stewardship and preservation	ICMA, NEMP, MSA	• Approval and funding obtained • Signage created and erected in key public spaces and main access routes • Signage maintained	**MEDIUM**	RNM
Management Priority 5.3 Maximise economic benefits				
i. Maintain the direct and indirect level of socio-economic dependency on the system • Holiday establishment dependant on state to attract visitors/encourage return • Tourism related activities (e.g., Jolly Boats, Big swing, Club Zuri activities etc. dependant on state to operate) • Commercial activities dependent on good state – reduced flooding, reduced erosion etc.)	ICMA, MSA, MFMA	• Improved overall state, health and appearance of system • Reduced habitat loss/degradation • Reduced sewage system malfunctions, and pollution incidents in river and estuary • Reduced bacterial loads in Hunters Stream and along Margate Beach • Applicable beach and lower estuary activities allowed, particularly during peak seasons • Degraded areas repaired • Parking formalised and bus overflow parking provided during peak seasons	**HIGH**	RNM, EDTEA, Ugu DM, COGTA, KZN DARD, DFFE
ii. Facilitate opportunities for activities to be implemented by commercial operators and/or local communities to develop around services on the estuary and in the EFZ (e.g., employment opportunities through operating commercial enterprises, car guards, life guards etc.)	ICMA, MSA, SPLUMA, MFMA	• Margate Urban Renewal study reviewed and implemented • Funding obtained for roll-out of results • Commercial opportunities implemented and supported	**HIGH**	RNM

8.6. Education, Awareness, Monitoring and Research

iKongeni estuary management priorities in respect to this management objective relate to improving levels of understanding and awareness of the value of the system by both residents and visitors to the area as well as continuing to monitor its state/condition, currently being undertaken by the iKongeni River Conservancy.

Table 22: Management Priorities for Education, Awareness, Monitoring and Research

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
Management Priority 6.1: Improve levels of public awareness and appreciation of the value of the iKongeni estuary				
i. Establish Adopt-a-River programme (or less formal "Adopt-a-Stretch/spot") with adjacent landowners and businesses	NWA, MSA	• Buy-in from landowners and businesses achieved • Adopt-a-river programme established • Biannual events held • Tonnes and types of waste removed • On-going monitoring and reporting undertaken	**HIGH**	RNM, EDTEA, DWS, DFFE
ii. Develop an effective education and awareness programme for the residents and visitors to RNM	ICMA, NEMP	• Education & awareness programme developed and implemented	**LOW**	RNM
iii. Source and/ or commission educational and informative material including signage, posters, pamphlets and webpage design	ICMA, NEMP	• Educational signage erected at strategic points • Posters and pamphlets erected/ disseminated • RNM estuaries webpage operational	**LOW**	RNM, EDTEA, DWS
Management Priority 6.2: Enhance the knowledge and understanding of the iKongeni estuary through monitoring				
i. Formalise the existing basic water quality monitoring programme, and consolidate with existing monitoring by all institutions (Ugu DM, RNM)	MSA, NWA, ICMA, NEMP	• Ugu 'Green Town' water quality monitoring programme reviewed to include more estuary sites • Consolidated monitoring programme implemented and maintained • Data produced and reported on, against RQOs • EMP informed by monitoring results going forward	**HIGH**	Ugu, RNM
ii. Undertake training of community monitors to participate in estuarine monitoring	ICMA, NEMP, NWA	• Number of volunteer community monitors trained	**HIGH**	RNM, iKongeni River Conservancy/ community members, WESSA/Blue Flag Programme

ACTION	RELEVANT LEGISLATION	PERFORMANCE INDICATOR	WORK PLAN	
			PRIORITY	RESPONSIBILITY
iii. Ensure existing 'report and track incident' link on RNM website is operational and allows public reporting of non-compliance and pollution incidents (e.g., illegal dumping, sewage spills).	MLRA, NEMA, MRPDA, MSA	• Website operational • Incidents reported, documented and responded to	**HIGH**	RNM, Ugu DM, EDTEA

9. INTEGRATED MONITORING PLAN

According to the standards for estuarine management, management actions should be based on evidence. Thus, monitoring is a crucial aspect of the adaptive estuarine management planning process as the generated data will be used to inform and update management decisions. However, the collection, processing and interpretation of such data, particularly ecological data, are generally costly and time-consuming and often require considerable scientific expertise. In the context of estuarine management, there are three broad categories of monitoring which should be incorporated into an integrated monitoring plan, namely Resource Monitoring, Compliance Monitoring and Performance Monitoring (DEA, 2015). These components are discussed the sections below.

9.1. Resource Monitoring

9.1.1. Existing Resource Monitoring

There is very little baseline ecological information available for estuaries in the RNM as a whole. The following components are being monitored:

- **National Department of Water and Sanitation** – The DWS monitors water quality at the Margate WWTW (final effluent) and has one water quality monitoring station in the iKongeni estuary as part of the National Surface Water Quality monitoring programme. It is of the utmost importance that this monitoring continues;
- **Umgeni Water (Bulk Services Provider)** – Umgeni Water undertakes monthly and twice-monthly compliance monitoring for WWTWs in the Ugu District, specifically the final effluent. A variety of determinants are assessed against the DWS General Authorisations or DWS General Standards for effluent discharges. Water quality monitoring is also undertaken upstream and downstream of the WWTWs discharging into river systems (see the WSMP, Ugu DM, 2020). The iKongeni River and estuary should be included in the list of systems monitored as it is a water resource directly affected by sewer network failures. The Margate WWTW is of particular concern and it is of the utmost importance that this monitoring continues;
- **Ugu District Municipality** –
    - Water quality samples are regularly collected by independent organisations and initiatives, such as Green Town, through and in agreement with, and on behalf of Ugu DM for human health and safety purposes (i.e., coliform bacteria, such *E. coli*.);
    - Ad hoc sampling is undertaken by Ugu DM (Environmental Services Dept.) in rivers and estuaries following sewage spills. In the Margate Beach area, sites sampled by Ugu DM include the iKongeni estuary mouth and in the beach swimming zone of Margate Main Beach. Other monitoring undertaken by Ugu DM relevant to the iKongeni estuary includes Hunters Stream adjacent to the Paradise supermarket (Manawer, *pers. comm.* 2021[8]); and
    - Ugu DM also undertakes sampling of the final effluent of the Margate WWTW (and other WWTWs), specifically in respect to *E.coli* and total coliforms concentrations[8]. This must also include the volume of effluent released to the surf zone outfall and/or the Kongweni River, which in

[8] Mrs. V. Manawer, Environmental Health Officer, Ugu District: Environmental Services

the case of the latter would enter the estuary. It is imperative that these monitoring activities continue;

- **WESSA Blue Flag Beach Programme** – WESSA has been managing the Blue Flag Beach Programme in South Africa since 2001. The international programme focusses on the environmental management of the coastline and coastal waters to help tourism growth and development. Beaches awarded Blue Flag status meet a standard of excellence in the areas of safety, amenities, cleanliness, and environmental education. Water quality monitoring is undertaken by the RNM Aquatic Safety department twice a month at Blue Flag beaches and adjacent estuaries specifically for *E. coli* (faecal coli bacteria) and Streptococci (intestinal enterococci). Margate Main beach and Lucien beaches used to be part of the Blue Flag Programme but this is no longer the case with previous monitoring being undertaken by the RNM been suspended (A. Botha, 2020, *pers. Comm.*[9]); and
- **Co-ordinated Waterbirds Counts (CWAC)** – The project was launched in 1992 as part South Africa's commitment to international waterbird conservation. The goal of CWAC is to act as an effective long-term waterbird monitoring tool, benefiting conservation efforts worldwide. This is being done by means of a programme of regular mid-summer and mid-winter censuses at many South African wetlands. While 11 CWAC sites are listed in the RNM (including the Munster WWTW), these are mostly concentrated in the south (Mtamvuna to Mvutshini), and recent counts have not been undertaken. The closest system for which data is available is the Mvutshini estuary, 4.5 km south of the iKongeni estuary.

9.1.2. Recommended Resource Monitoring

Given the high tourism value of Margate Main Beach and the potential high level of human interaction with the iKongeni estuary during peak visitor periods, the iKongeni estuary should be prioritised for regular monitoring of both abiotic and (some) biological aspects (DWA 2013).

The requirements and methodology for resource monitoring is prescribed by the *Methods for the Determination of the Ecological Water Requirements Reserve for estuaries* (2011). The EcoClassification of estuaries in the RNM was undertaken as part of the Mvoti-Umzimkulu WMA Classification Study (DWA, 2013). While the Ecological Water Requirements (EWR) were not determined, the Ecological Specifications (or targets), against which to assess the ecological health of the iKongeni estuary, were recommended (Breetzke, Meyer and Kinvig, 2020).

The main priority is to establish a long-term monitoring plan to track the water quality in terms of its suitability for human contact as well as to acquire the necessary data on an ongoing basis to increase our knowledge of the system, especially its response to management inventions, such as those proposed in this EMP.

Given the financial and human capacity constraints, the minimum long-term monitoring recommended for ascertaining the impacts of current and future pressures on the iKongeni estuary is listed in Table 23, [**in bold and highlighted in grey**] adapted from the DWA (2011). Priorities are indicated as high, medium and low for ease of reference.

In comparison, baseline surveys are once-off, intensive assessments to collect data relating to a wide range of factors, primarily to gain key information on the composition and structure of estuarine communities and a better understanding of estuarine processes, patterns and functioning. Such detailed information may be obtained, through focussed national/ regional research projects, university studies or other local investigations (e.g., EIAs) and utilised by the RMA to update the SAR and amend management interventions.

[9] Mr. A Botha, Ray Nkonyeni Municipality Beach Manager, 5 August 2020

Table 23: Recommended minimum requirements for long-term monitoring (Priority: Red = High; Orange = Medium, Yellow = Low)

COMPONENT	MONITORING ACTION	TEMPORAL SCALE (FREQUENCY AND WHEN)	SPATIAL SCALE (NO. STATIONS)	PRIORITY
Hydro-dynamics	Record estuary water levels	Continuous	In main water body	
	Observe mouth status	Daily or weekly	Mouth	
	Measure river inflow (supplemented by effluent released from Margate WWTW, if any)	Continuous	Near head of estuary	
	Satellite photographs of estuary (30x 30 m).	Every 3 years	Entire estuary	
Sediment dynamics	Bathymetric surveys: Series of cross-section profiles and a longitudinal profile collected at fixed 100-200 m intervals, but in more detail in the mouth. The vertical accuracy should be about 5 cm.	Every 3 years	Entire estuary	
	Set sediment grab samples (at cross section profiles) for analysis of Particle Size Distribution (PSD) and origin (i.e., using microscopic observations).	Every 3 years (With invert sampling)	Entire estuary	
Water quality	**Water quality (e.g., system variables (e.g., pH, oxygen, turbidity), nutrients and toxic substances) measurements in the surface water entering the head of the estuary (supplemented by ongoing institutional monitoring indicated above)**	**Monthly continuous**	**Close proximity to head of estuary**	
	***In situ* salinity and temperature observations.**	**Monthly continuous**	**In main water body (1 to 3 stations)**	
	Longitudinal salinity and temperature profiles (in situ) collected over a spring and neap tide during high and low tide at: End of low flow season (i.e., period of maximum seawater intrusion). Peak of high flow season (i.e., period of maximum flushing by river water).	Every year at end of dry season	Entire estuary (2-5 stations)	
	Water quality measurements (i.e., system variables, and nutrients) taken along the length of the estuary (surface and bottom samples).	Seasonal surveys, every 3 years	Entire estuary (2-5 stations)	
	Measurements of organic content and toxic substances (e.g., trace metals and hydrocarbons) in sediments along length of the estuary, where considered an issue.	Every 5 years	Focus on sheltered, depositional areas	
	Water quality (e.g., system variables, nutrients and toxic substances) measurements on near-shore seawater.	**Use available literature**	**Seawater adjacent to estuary mouth at salinity 35**	
Microalgae	Record relative abundance of dominant phytoplankton groups, i.e., flagellates, dinoflagellates, diatoms and blue-green algae.	Summer survey every 3 years	Entire estuary	

COMPONENT	MONITORING ACTION	TEMPORAL SCALE (FREQUENCY AND WHEN)	SPATIAL SCALE (NO. STATIONS)	PRIORITY
	Chlorophyll-a measurements taken at the surface, 0.5 m and 1 m depths, under typically high and low flow conditions using a recognised technique, e.g., HPLC.			
	Intertidal and subtidal benthic chlorophyll-a measurements.			
Macrophytes	Ground truth maps to document changes in macrophyte habitats over time. Document area covered by sensitive habitats i.e., submerged macrophytes.	Summer survey every 3 years	Entire estuary	
	Record number of macrophyte habitats, identification and total number of macrophyte species, number of rare or endangered species or those with limited populations documented during a field visit.			
	Note extent of macroalgal blooms, floating aquatic macrophytes and area occupied by invasive vegetation.			
	Take measurements of depth to water table	Summer survey every 3 years	Upper reaches	
Invertebrates	Record species and abundance of zooplankton, based on samples collected across the estuary.	Summer survey every 3 years	Entire estuary (2-5 stations)	
	Record benthic invertebrate species and abundance, based on subtidal and intertidal grab samples at a series of stations up the estuary, and counts of hole densities.			
	Measures of sediment characteristics at each station.			
Fish	Record species and abundance of fish, based on seine net sampling.	Summer survey every 3 years	Entire estuary (2-5 stations)	
Birds	Undertake counts of all water associated birds, identified to species level.	Annual winter (Jul/Aug) and summer (Jan/Feb) surveys	Entire estuary	

9.2. Compliance Monitoring

Compliance monitoring refers to the monitoring of the character and intensity of uses/activities and developments within an estuary, that is the EFZ. Such monitoring is usually prescribed in relevant legislation, regulations, policies, standards, guidelines and or permits and license agreements (DEA, 2015). The purpose of this form of monitoring is to test whether activities are compliant with the established limits and objectives, as well as to detect growing pressures on the resources.

Compliance monitoring in respect to the discharge of domestic effluent falls within the ambit of the Department of Water and Sanitation (DWS). Compliance can be assessed in terms of the Water Use License (WUL) as well as the Coastal Waters Discharge Permit (CWDP) for the Margate WWTW (once both completed and submitted for urgent consideration), and the discharge standards therein, as well as the national guidelines for aquatic and coastal ecosystem health (DWAF, 1995, 1996; DEA, 2012). The Ugu DM, as the entity responsible for the management and treatment of wastewater and associated bulk infrastructure as well as water purification, must be held accountable in the event of any non-compliance. This is also applicable to the surf-zone outfall located off the Lucien Beach headland.

Prospective developers and the RNM will be accountable to KZN EDTEA as well as the DWS in undertaking development activities within the EFZ. Legal due process must be followed and enforced in respect to any new development or development changes within the sensitive and vulnerable coastal space, especially land-use controls within the Coastal Protection Zone / EFZ. Special attention must be given to development encroachment, land reclamation / infilling, and erosion defence, particularly after severe weather events. Compliance monitoring is also required in respect to waste management, specifically, illegal dumping. Those responsible for illegal dumping, and other infringements must be held responsible for collection and correct disposal of the dumped material and remediation of the affected environment. It is also important to remember that activities within the catchment ultimately have an impact on the estuary and the coastal environment in various ways not limited to surface hardening, increased stormwater run-off, pollution, and sedimentation.

Compliance monitoring in the RNM in respect to estuarine/marine living resource use is essentially non-existent (apart from protected areas), with the disbandment of the Ezemvelo KZN Wildlife MLRA compliance officers and uptake of the compliance mandate to the Department Forestry, Fisheries and Environment (DFFE, formerly DAFF). Compliance monitoring by the relevant authority will be most important during the peak holiday season when increased usage of the estuary and sand bar/beach for bait collection and shoreline angling and/or netting by holiday makers, is anticipated.

Table 24: Recommended compliance monitoring

USE / ACTIVITY	INDICATOR	TEMPORAL SCALE (frequency)	TARGET/LIMIT	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
EFFLUENT DISCHARGE (including treated waste water, and stormwater and grey water outlets)	No. of discharge points, volume of effluent discharged, no. of system failures and/or spillages, water quality variables to monitored, reported contraventions	Peak and off-peak periods for wastewater, As per pending WUL /CWDP conditions, High and low-flow periods for stormwater	80% compliance	NWA, Effluent disposal standards, Water use license conditions, MSA NHA	DWS, RNM, Ugu DM, DFFE

USE / ACTIVITY	INDICATOR	TEMPORAL SCALE (frequency)	TARGET/LIMIT	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
LAND-USE AND DEVELOPMENT ACTIVITIES	Nature, location and extent of activities, extent of degradation/habitat alteration	Continuous	Non-compliance reduced by 50%	NWA, SPLUMA, NEMA, EIA Regulations, ICMA, MPRDA, MSA, NEM:BA, NEM: PAA, NEM: WA, Seashore Act	RNM, EDTEA
FISHING	No. of fishers, No. of permits, reported contraventions	Peak holiday season	Non-compliance reduced by 50%	MLRA	DFFE
BAIT HARVESTING	No. of harvesters, No. of permits, reported contraventions	Peak holiday season	Non-compliance reduced by 50%	MLRA	DFFE

9.3. Performance Monitoring

The performance monitoring plan is proposed to be used by the RMA, the RNM (and/or implementing agents), supported by the Ugu DM in the interim, to assess the effectiveness with which planned management activities contained in the EMP are being performed and ultimately to gauge progress in achieving the vision and objectives. This component utilises the performance indicators included for the various actions, specifically the management priorities, and includes a temporal scale or the frequency of the collection of the performance data and the targets that should be achieved.

Ultimately the EMP must be holistically reviewed every 5 years from the date it was adopted, ideally in line with the review cycles of the IDP, SDF and/or CMP. This review is the responsibility of the RMA, the RNM. According to the NEMP, this review should include an assessment of:

- Effectiveness of the EMP and success with meting the objectives (i.e., the performance monitoring plan);
- Environmental changes at a local or a wider scale that could affect the estuarine resources or the implementation of the EMP; and
- Changes (if any) to legislation, land-use planning, goals or policies that may require the EMP to be amended.

This review may involve revisiting the SAR to determine the progress or changes that have come about because of the EMP in terms of the objectives that were originally set, and may also require the EMP to be amended, including a revision of the objectives, amendments to the management actions, and/or monitoring protocols. Ideally, representatives and experts in the major sectors (e.g., water quantity and quality, land-use and infrastructure planning and development), should evaluate the efficiency of the EMP in the context of their mandate or area of expertise. Public participation will be required before the amended EMP can be approved.

Table 25 below provides the performance monitoring plan relative to the proposed management priorities.

Table 25: Recommended Performance Monitoring Plan for Estuarine Management in RNM

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
1. ESTUARINE HEALTH AND FUNCTION				
i. Secure adequate quantity and quality of freshwater input to improve and maintain ecosystem health and functioning by specifically reducing the amount of sewage inflows	• REC, RQOs and minimum D health class incorporated into Water Services and Sanitation Master Plans • Hydrological survey undertaken • Improved operation and maintenance of WWTW • WW discharge to river reduced • Well maintained sewage infrastructure particularly within sensitive EFZ • Quality of Hunters Stream inflow improved • Improved catchment and estuarine water quality	• Biannual for DWS	NWA	RNM, CMA, DWS, NGOs
ii. Minimise other forms of pollution by identifying and addressing activities that lead to poor water quality	• Pollution mitigation plan developed and appropriate interventions instated • Environmental best practice adopted by contributors • SOP or contingency plan is adopted, implemented and effective in reducing the impacts of spillages • Negative environmental impacts and pollution incidents mitigated, and offenders prosecuted • Stormwater system operating effectively, well maintained, and monitored regularly • Sihlanzimvelo Stream Cleaning Project supported • River clean-up programme instated and active community stewardship/involvement • Informative signed developed and implemented	• Twice a year • Post spill	MSA, NWA, ICMA, DMA	RNM, Ugu, DWS
iii. Rehabilitate degraded areas	• Effective implementation of post spill rehabilitation measures • Rehabilitation plan developed, and priority degraded areas restored • Damages/degraded areas on private property addressed	• Post spill monitoring • Ad hoc visual monitoring	NEM:BA, NWA, CARA	RNM, EDTEA, DWS, I&APs, identified landowners/ companies
iv. Ensure effective mouth management that enables maximum tourism benefits while maintaining adequate estuarine functioning	• Sensitive breaching practices adopted and undertaken in accordance with the updated MMP and accompanying Maintenance Management Plan • EDTEA/RNM Bilateral held	• As and when required	MSA, NWA, NEMA, ICMA, NEMP	RNM, EDTEA

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
2. CONSERVATION				
i. Ensure the conservation of remaining estuarine habitats	• River reserve extended to encapsulate entire EFZ through formal procedures • Spatial zonation plan adopted • Bylaws updated/developed and gazetted • Signage created and erected in key public spaces • Increased stewardship and sense of ownership by all landowners and business owners	• Annually • Ecological monitoring every 3 years	ICMA, NEMP, MSA	RNM
ii. Control the spread and densification of both aquatic and terrestrial invasive alien plant species	• Include iKongeni estuary in RNM IAPs eradication programme • Increased area / tonnes of IAPs removed	• Annually	CARA, NEM:BA	RNM, DEA: WftC, WfW, I&Aps,
iii. Ensure sustainable resource use through an effective level of compliance management	• Spatial zonation plan demarcated and enforced using signage • Compliance monitoring / patrols undertaken by conservancy members, findings documented and reported on	• Annually	MSA, ICMA, NEMP, MLRA, NWA, NEMA	RMA, DFFE, EDTEA, DMR
3. LAND USE AND INFRASTRUCTURE DEVELOPMENT PLANNING				
i. Ensure the effective implementation of the EMP	• EMP approved and incorporated into IDP during cyclical review • Spatial zonation included in SDF and LUMS as part of cyclical review	• Annually	ICMA, NEMP, MSA, SPLUMA	RNM
ii. Minimise the potential impacts of climate change	• CML determined, adopted and reflected on SDF and LUMS • Specific land use control decisions adapted • Engagement with property owners • Increased application of SUDS and improvement of EI to alleviate flood risk	• Once-off (review after 5 years and extreme events)	MSA, NWA, ICMA, SPLUMA, NEMA	RNM, EDTEA
iii. Facilitate and manage the sustainable utilisation and development of the areas within the EFZ	• Inspections undertaken, transgressors prosecuted, and remedial actions implemented • Effective control of stormwater inputs • Remaining indigenous vegetation and habitat is preserved and valued • Shift toward green/environmentally sensitive development and behaviour ultimately leading to improved environmental quality • Effective and positive ongoing relationship with property owners	• Ad hoc • Inventory reviewed 5 years	NEMA, NWA, NEM:BA NEM: PAA, NHA, MSA, ICMA, SSA	EDTEA, RNM, DMR, DWS

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
4. INSTITUTIONAL AND MANAGEMENT STRUCTURES				
i. Ensure effective co-ordination of estuarine management responsibilities	• Estuarine management coordination function undertaken by Ugu DM • EMC appointed in the long term after investigation of most appropriate sphere of government location • Relevant official(s) attend accredited estuarine management course • Ugu Estuarine Sub-committee meetings chaired by Ugu DM • Voluntary community monitoring team established and data collected on an ongoing basis • Bylaws developed/updated and published in local gazette	• Quarterly	NWA, ICMA, NEMP, NWA, MSA	RMA, RNM and participating institutions
ii. Define co-operative governance arrangements for the iKongeni estuary	• MOUs signed between RMA and spheres of government and participating agencies • Ugu Estuarine Sub-committee constituted and meets on a quarterly basis • Active collaboration of various institutions, private and civil stakeholders • Stakeholder database maintained • Formal review of EMP every 5 years • Ugu Estuarine Sub-committee represented at CMA forum meetings	• Annually	ICMA, NEMP, MSA, SPLUMA, NWA, NEM: PAA, MPRDA	RNM EAF and participating institutions & stakeholders
iii. Secure financing for estuarine management initiatives	• Funds secured for 5 years • Long term funding plan developed, and reviewed on an ongoing basis	• Annually	ICMA, NEMP, MSA, SPLUMA, NWA, NEM: PAA, MPRDA, MFMA, PFMA,	RNM and participating institutions
5. SOCIO-ECONOMIC CONSIDERATIONS				
i. Provide safe, clean, equitable and controlled access	• Access facilities well maintained through a scheduled maintenance programme • RNM Peak Season Maintenance Plan implemented – estuary well maintained/protected over peak season	• Annually	ICMA, MSA	ICMA, MSA

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
ii. Regulate recreational use in and around the estuaries	• EMP and SZP approved, and incorporated into SDF and LUMS • EFZ demarcated with markers/signage if necessary • Signage procured, installed and maintained • EFZ controls enforced and offenders prosecuted • High impact activities prevented through updated Bylaws • Increased environmental awareness and education via informative signage	• Every 3 years	ICMA, NEMP, MSA, SPLUMA	RNM, DFFE
iii. Maximise economic benefits	• All actions of EMP adopted and implemented synergistically to improve the overall state of the estuary • Increased economic activity, visitor expenditure and occupancy and overall municipal economic returns • Reduced bacterial loads in Hunters Stream and along Margate Beach • Applicable beach and lower estuary activities allowed, particularly during peak seasons • Degraded areas repaired • Parking formalised and bus overflow parking provided during peak seasons	• Every 3 years	ICMA, MSA, SPLUMA, MFMA	RNM, EDTEA, Ugu, COGTA, KZN DARD, DFFE
6. EDUCATION, AWARENESS, MONITORING AND RESEARCH				
i. Improve levels of public awareness and appreciation of the value of the iKongeni estuary	• Buy-in from landowners and businesses achieved • Education & awareness programme developed and implemented • Increased environmental awareness and education via informative signage • Reduced negative impacts and activities	• Every 3 years	ICMA, NEMP, CARA, MLRA	RNM, EDTEA, DWS, DARD / DFFE
ii. Enhance the knowledge and understanding of the iKongeni estuary through monitoring	• Green Town water quality monitoring programme reviewed • Volunteer community monitors trained, and conservancy engaged to facilitate on-going monitoring • EMP updated by data/monitoring results going forward • Reduce number and impacts of incidents	• Monthly • Twice a year • Twice a year	ICMA, NEMP, NWA, MFMA, MSA, MLRA	Ugu, DWS, RNM, DARD, EDTEA, community members, DFFE

10. RESEARCH REQUIREMENTS

As previously detailed in the SAR (Breetzke, Meyer and Kinvig, 2020), Forbes & Forbes (2012, p. 125) state that "*the collective value of the small systems of KZN comes from the cumulative area of the estuarine nursery grounds contained within the estuarine functional zones and the overall connectivity they impart to estuaries within the region*." Despite the highly degraded state of the iKongeni estuary, at a local level it is critically important in terms of tourism that it maintains some ecological value as a coastal habitat in an otherwise urban environment.

Physical, chemical and biological information on the iKongeni estuary is either scarce or the available data is significantly outdated. More recent data generation is generally piece-meal or undertaken at a desktop level corroborated by expert input (DWA, 2013; DWS, 2015b; Van Niekerk, Adams, Lamberth, MacKay, *et al.*, 2019). This is the case for most of RNM estuaries.

The following specific recommendations with the view of preventing further degradation of the iKongeni estuary are:

- Maintain basic monitoring toward establishing a long-term database, to monitor impacts and guide mitigation measures;
- Co-ordinated research of the biotic and abiotic components to gain a better understanding of the estuarine structure and functioning to better inform management decisions;
- Establishing the contribution of the estuary, and other south coast systems, to the regional estuarine nursery function;
- Compile a municipal inventory of estuarine pollution sources. Although the generic sources are anticipated, the location of these sources and responsible contributors need to be detailed at the local level to solicit support to resolve ongoing problems. Specific clarity is required regarding the volume of effluent discharged from the Margate WWTW to the Kongweni River and to the surf zone outfall;
- By virtue of coastal development within the EFZ (and many others estuaries in RNM), flooding is a very real and regular threat, from estuary mouth closure and backflooding, and on the sea front. A hydrological survey, including the assessment of flood levels and causes, must be determined to formally establish flood risks and thus develop appropriate alerts and responses/mechanisms to mitigate these risks; and
- An updated economic evaluation of the ecosystem goods and services provided by the iKongweni estuary should be undertaken as it would be useful to ascertain how (if) this has decreased due to the degraded state of the system.

11. CONCLUDING REMARKS

Through this EMP development process, it is unambiguously apparent that the iKongeni estuary has long history of human disturbance and interference which persists today. Within the highly transformed and urbanised landscape, what remains of the iKongeni system is frequently subjected to spills of domestic effluent, with negative ecological consequences and an increased need to artificial breach as well as negative socio-economic consequences due to potential human health risks and closure of Margate Main Beach thus affecting tourism.

It is important to acknowledge that the iKongeni estuary does have important role to play at a regional level despite its degraded state, particularly in terms of socio-economic value, and ecological value in terms of coastal habitat provision in an otherwise highly urbanised environment. It is for these reasons that further deterioration of iKongeni estuary must be prevented through effective and co-ordinated management by the relevant institutions. It is not the estuary itself that needs to be managed, but rather human activities which continue to negatively affect the integrity of the estuary and the ecosystem goods and services it provides.

It is absolutely imperative that the aged, failing and/or under capacitated sewage infrastructure receive urgent attention, that funding is prioritised and allocated accordingly, and that plans for upgrades and maintenance work are expedited.

It is important that implementation of this EMP be reviewed annually, and both the EMP and SAR be updated at the mandatory 5-year interval. However, updates can also be made as and when critical information becomes available.

Overall, what is required is a change in mindset and the acknowledgement of that this neglected estuarine ecosystem as a valuable asset worthy of defence and upgrade, to the benefit of both the environment and coastal communities.

In conclusion, **priority actions** requiring immediate attention are summarised as:

- Urgent relevant authorities' workshop to be convened to review and update the iKongeni estuary draft Mouth Management Plan, Maintenance Management Plan as well as the draft SOP in response to emergency incidents (including undertaking the required stakeholder engagement process);
- Planned upgrades to the Margate WWTW and sewerage infrastructure undertaken and implementation fast tracked;
- Reinstate and complete the outstanding WUL and CWDP application process and submit for authorisation;
- Erect/install applicable signage;
- Ensure the proposed RNM stormwater management master plan includes all aspects included in this EMP; and
- Establish Ugu District Coastal Committee, Estuaries sub-committee.

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13. APPENDICES

13.1. Appendix A: Proposed template for project plans

Source: (DEA, 2015)

ACTION	Describe the action to be undertaken
COMPLETION DATE	Provide date of expected completion
PERFORMANCE INDICATOR	
Requirements stipulated in policy and legislation	
Available methods, protocols and best practice-guides	
Spatial zonation consideration (e.g. limits/targets)	
Detailed work plan	Task 1: Task 2: Task 3: Task 4:

Scheduling

TASK	TIME (months)								
	1	2	3	4	5	6	7	8	9
1									
2									
3									
4									

Milestone/interim performance indicator

MILESTONE	INTERIM PERFORMANCE INDICATOR	DUE DATE
1		
2		
3		

Responsibilities for different tasks

E.g. Identify specific departments, personnel and/or service providers responsible for execution of this action

Monitoring and reporting plan

E.g.

- Define data and information to measure in order to monitor performance indicator/s
- Specify frequency at which data/information should be collected/monitored
- Where and when to report on progress

Human resource plan

HUMAN RESOURCE	WEEKS PER TASK			
	1	2	4	4
Staff member 1				
Staff Member 2				
Service provider				

Financial resource plan

TASK	COST (ZAR)
1	
2	
3	
4	
TOTAL	