Rehabilitation Management Guidelines (RMGs) for Water Resources Project Steering Committee Meeting 03

Technical Presentation for Estuaries Reports

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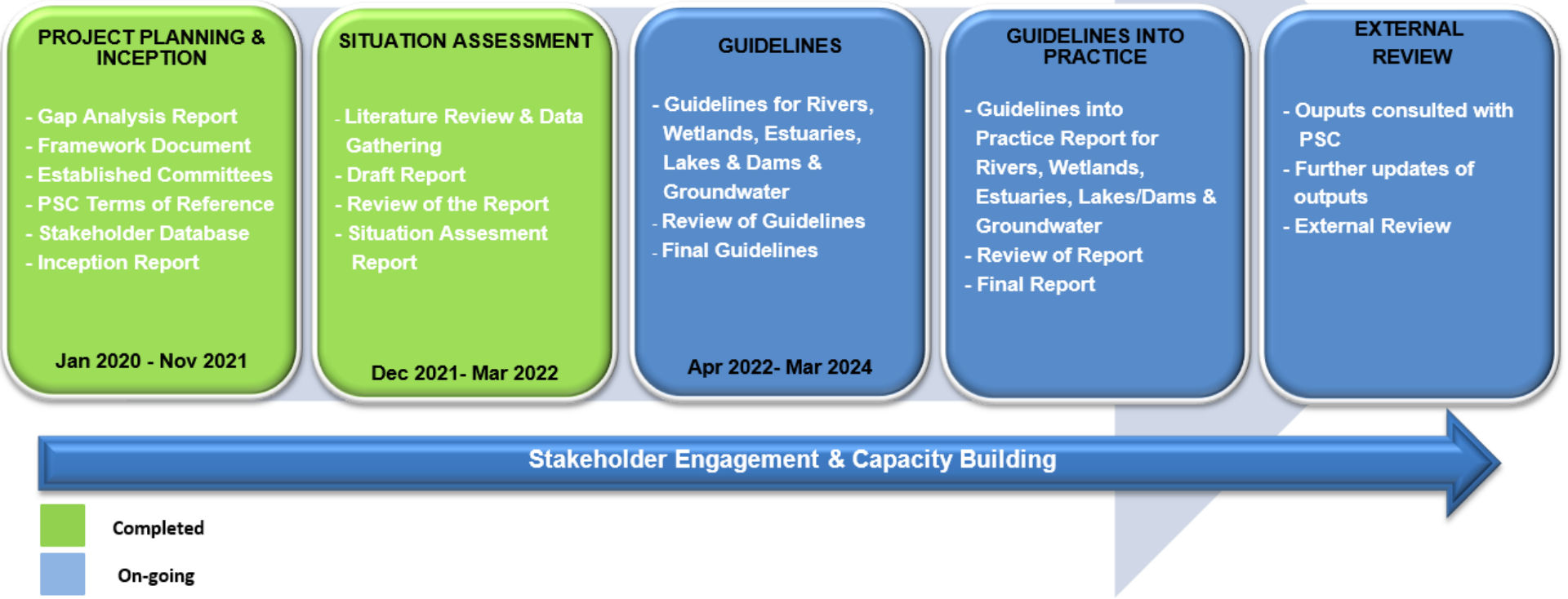
WATER IS LIFE - SANITATION IS DIGNITY

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2030 NDP

Project Deliverables & Progress

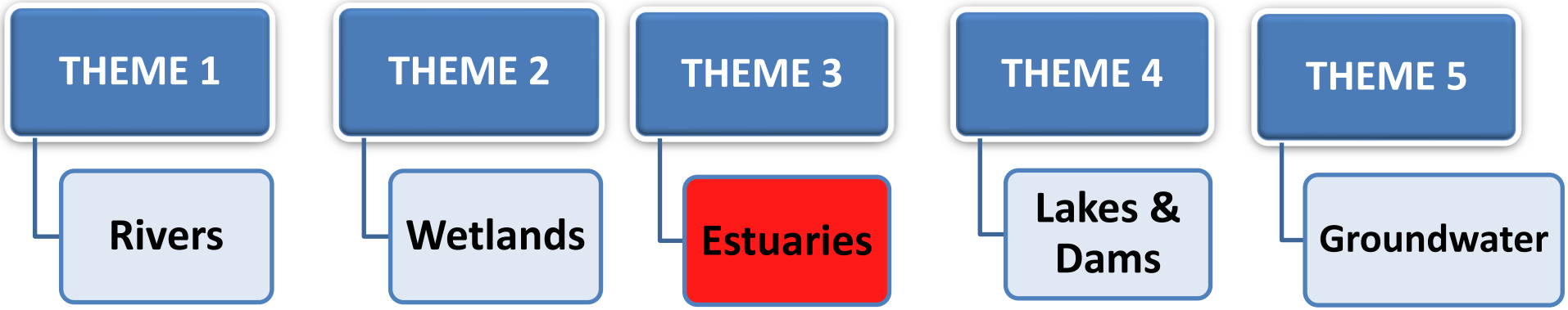


Purpose of Estuarine Report

- The aim of the report is to develop Rehabilitation Management Guidelines (RMGs) for **Estuaries** that address the following characteristics of watercourses:
  - ✓*Hydrology;*
  - ✓*Geomorphology;*
  - ✓*Water quality;*
  - ✓*Habitat; and*
  - ✓*Biota*

Water Resources Themes

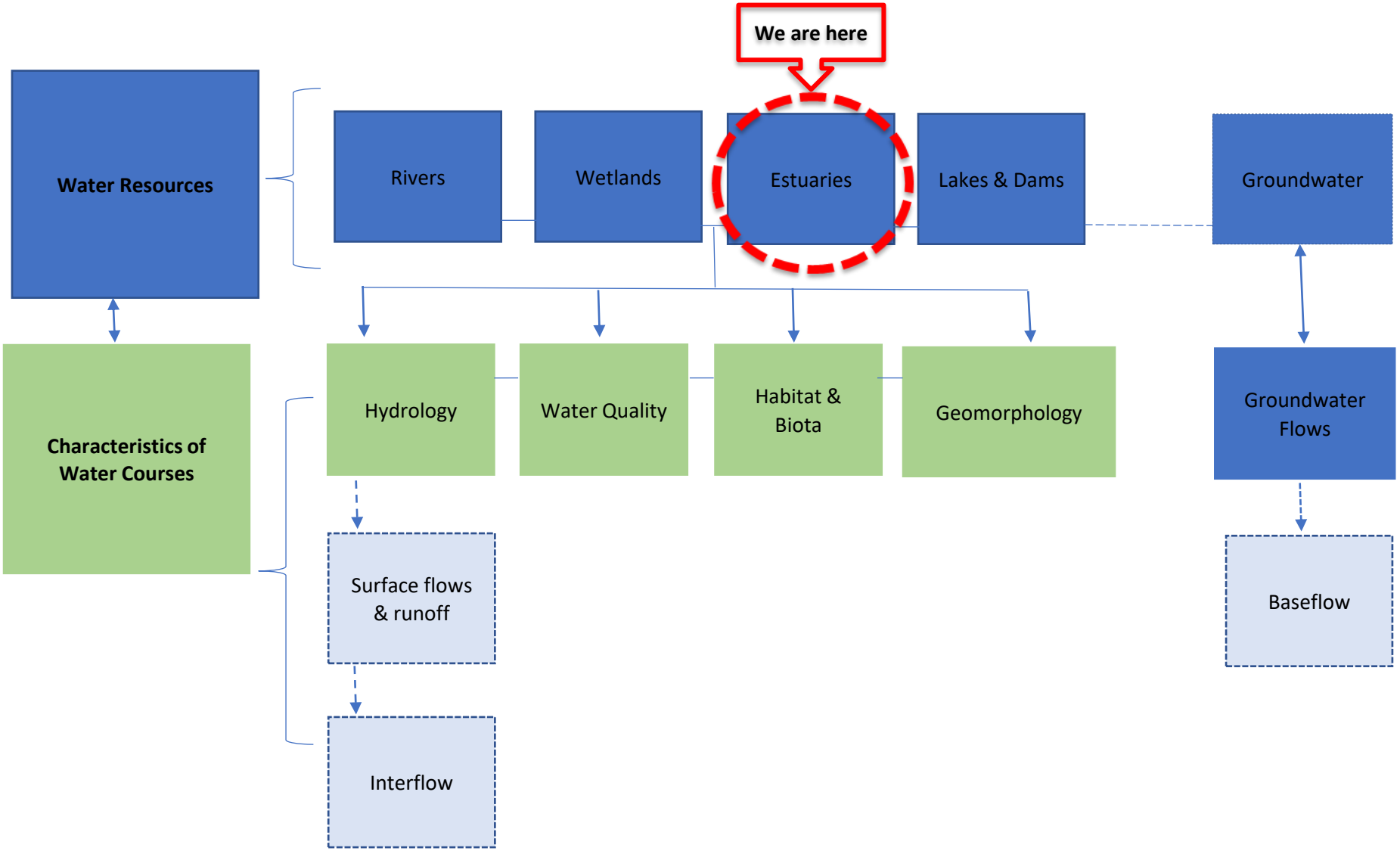
- Themes identified & categorized into **Rivers, Wetlands, Estuaries, Lakes and Dams and Groundwater** as per the definition of water resource (National Water Act)



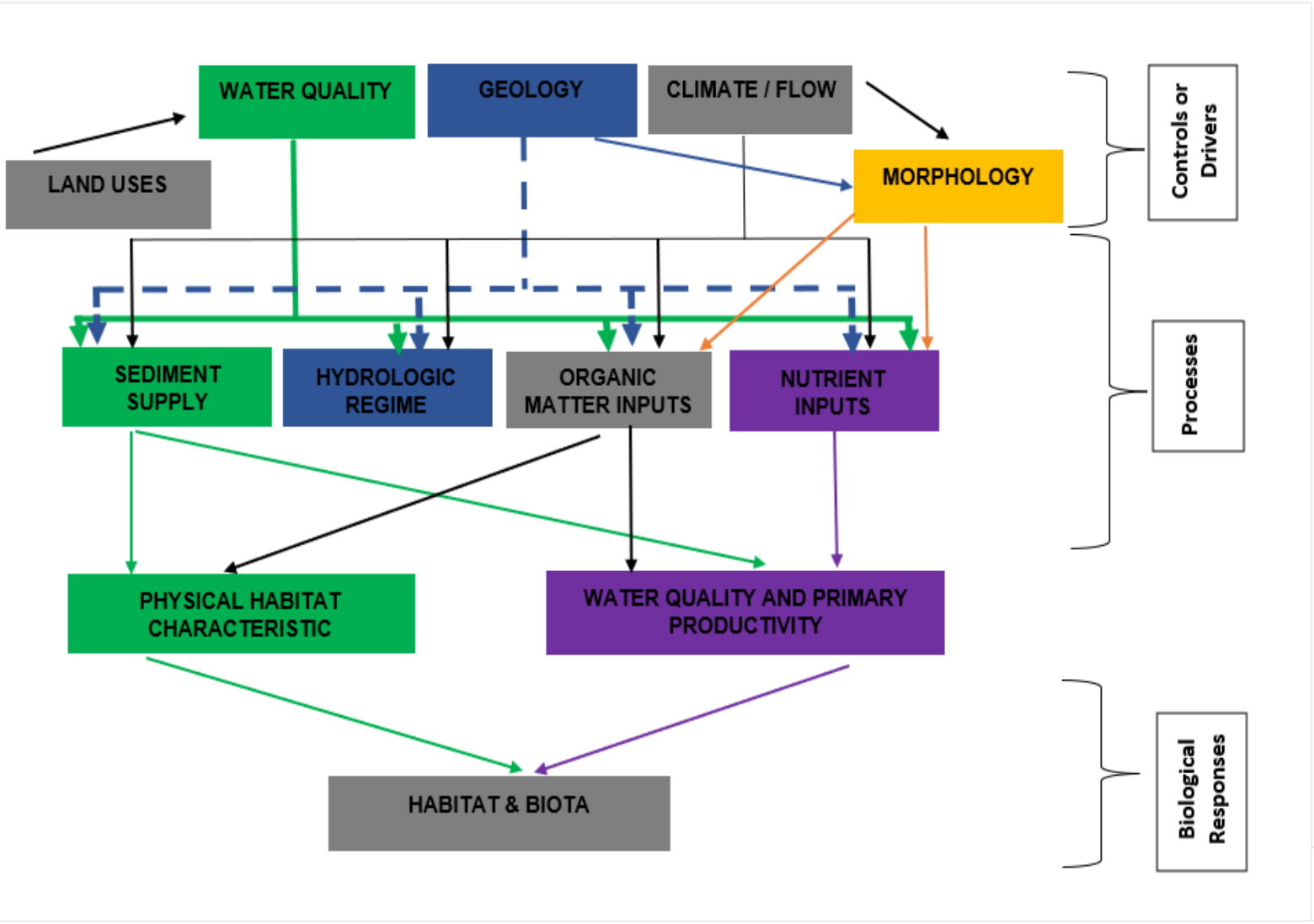
Definition of Watercourses

- In terms of the definition contained within the NWA, Act 36 of 1998, a watercourse means:
  - ✓ *A **river** or **spring**;*
  - ✓ *A **natural channel** from which water flows regularly or intermittently;*
  - ✓ *A **wetland, dam**, or **lake** into which, or from which, water flows;*
  - ✓ ***Any collection of water** which the **Minister** may, by notice in the **Gazette**, **declare** to be a watercourse; and*
    - *A **reference** to a watercourse includes, where relevant, its **bed** and **banks***

Link between Water Resources & Watercourses



Interlinkages between drivers and responses



Adapted from Beechie and Bolton (1999)

Rehabilitation Approach

PHASE 1:

Diagnostic Phase

Determine the conditions and the type, size, extent of impacts on characteristics of watercourses

PHASE 2:

Planning & Assessment Phase

- Assess and collate available information from maps & datasets on the affected watercourses
- Review and assess legal considerations

PHASE 3:

Identify & Define the Rehabilitation Objectives

Detail the objectives of rehabilitation to ensure the impacts on the characteristics of watercourses are addressed

PHASE 4:

Execution Phase

Recommend techniques and methods to address impacts identified. Consider protection of water resources ecosystem services, people & livelihoods.

PHASE 5:

Monitoring & Evaluation

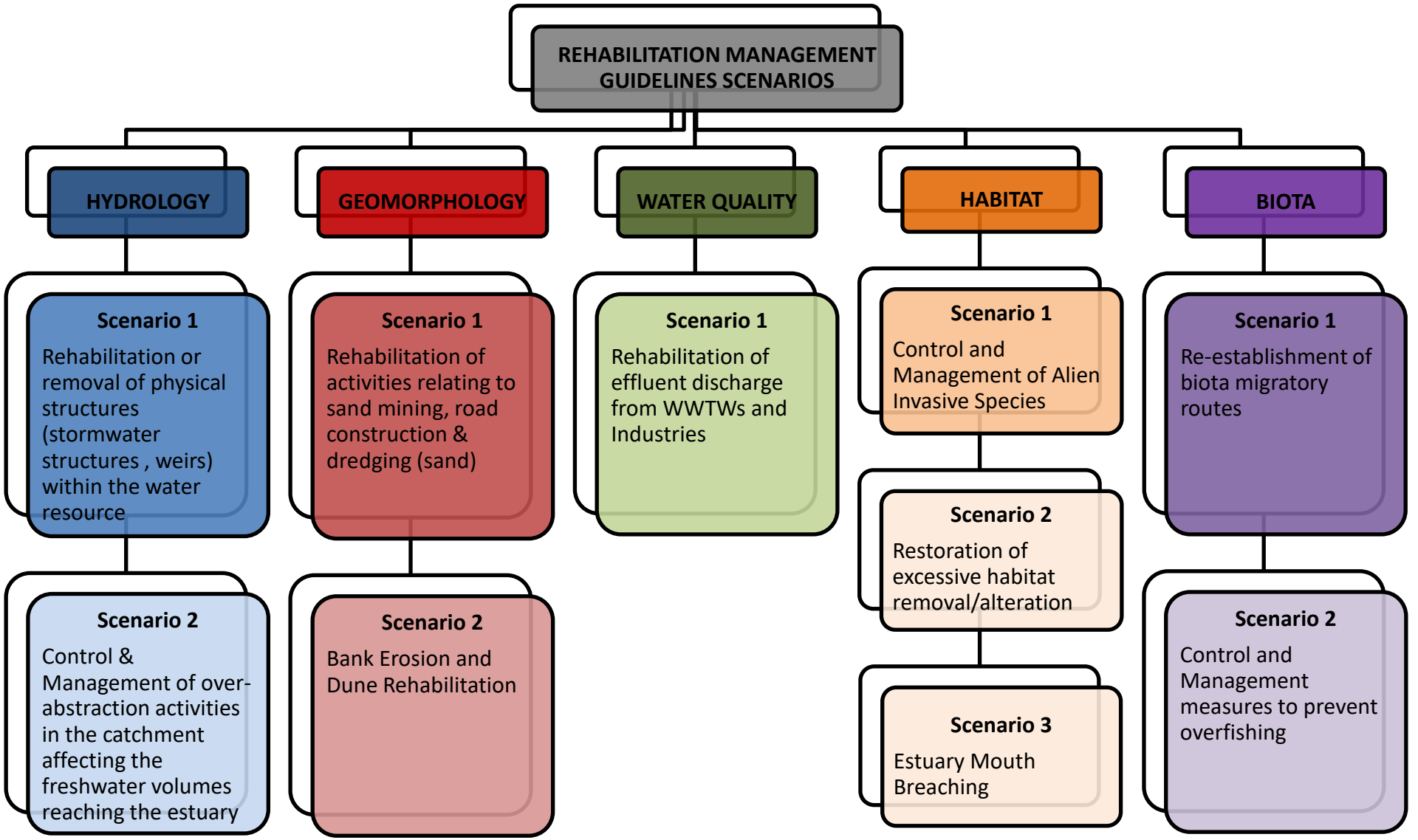
- Monitor the results of the techniques and methods employed for rehabilitation
- Evaluate the effectiveness of interventions against achievement of rehabilitation objectives and outcomes
- Determine maintenance objectives

Stakeholder Engagement

List of applicable legislation for Estuaries

- Constitution of the RSA (1996)
- National Water Act (36 of 1998)
- National Environmental Management Act (107 of 1998)
- National Environmental Management: Biodiversity Act (10 of 2004)
- National Environmental Management: Protected Areas Act (57 of 2003)
- Integrated Coastal Management Act (24 of 2008, amended 2014)
- Environment Conservation Act (73 of 1989)
- Conservation of Agricultural Resources Act (48 of 1993)
- Western Cape Land Use Planning Act (13 of 2014)
- Spatial Planning and Land Use Management Act (16 of 2013)
- Municipal By-laws
- National Heritage Resources Act (24 of 1999)
- Mineral and Petroleum Resources Development Act (28 of 2002)
- Sea Fishery Act (12 of 1998)
- Marine Living Resources Act (18 of 1998)

Rehabilitation Management Guidelines for Estuaries Scenarios



Hydrology (1)

Identified Impacts

- **In-stream infrastructure including dams, weirs, bridges & stormwater structure**
- Over-abstraction
- Urbanization and poor land use
- Jetties, piers & slipways/launching ramps

Scenario 1: Rehabilitation or removal of physical structures (stormwater structures, weirs) within the water resource

Phase 1: Diagnostic

STEP 1:

Identify the physical structures that need to be rehabilitated or removed

STEP 2:

Conduct desktop assessment of the physical structures that need to be removed

STEP 3:

Consult local, provincial or national authorities responsible for the physical structures (municipal as well as Provincial DWS & DFFE Offices)

Phase 2: Planning & Assessment

STEP 1:

Conduct ground truthing of the physical infrastructure that needs to be rehabilitated or removed

STEP 2:

If the physical structures are legal, conduct a public participation process for the removal of these physical structures in accordance with NEMA regulations

STEP 3:

If the physical structures are illegal, the responsible person must remove the mentioned structure, or the authority would follow the litigation process

Phase 3: Defining Rehabilitation Objectives

STEP 1:

Define clear rehabilitation objectives based on information and data gathered in **Phase 1** and **2**

Examples:

Some of the common objectives are to:

- Remove or rehabilitate any physical structures within the estuary, without inducing other adverse impacts
- Rehabilitate a more natural flow regime by removing the physical structures
- Revitalise the natural regime of the estuary by removing any obstruction in the estuary
- Improve biodiversity by allowing the revitalisation of the natural regime of the estuary
- Prevent habitat degradation

Phase 4: Execution

Removal or rehabilitation of stormwater discharge structures

IMPACTS

- Alters flow dynamics
- Cause changes in erosion and sedimentation processes
- Habitat transformation/loss
- Water quality pollution

INTERVENTIONS

- Sustainable Urban Drainage Systems should be used where applicable
- Rehabilitation of stormwater outlets should comply with local municipal by-laws, general best practices, and resist erosion and flood events

Phase 5: Monitoring & Evaluation

Monitoring

Evaluation

STEP 1:

- Ensure that the quantity and quality of stormwater is managed prior to reaching the natural environment, in so far as practical

STEP 2:

- Monitor the rehabilitated/removed structures
- Monitor the change in the natural processes of the environment, the flow and habitat conditions . If there is a negative change, deal with it accordingly

STEP 1:

- Evaluate the effectiveness of interventions against achievement of rehabilitation objectives and outcomes
- Determine maintenance objectives

Hydrology (2)

Identified Impacts

- In-stream infrastructure including dams, weirs, bridges & stormwater structure
- **Over-abstraction**
- Urbanization and poor land use
- Jetties, piers & slipways/launching ramps

Scenario 2: Control and Management of over-abstraction activities in the catchment affecting the freshwater volumes reaching the estuary

Note:
Human induced disturbances such as over-abstraction of water from rivers result in flow impediment impacts and changes in flow drivers and hydrodynamics of the estuary, which have direct impact on ecological category health (including habitat and biota) of estuarine systems

Phase 1: Diagnostic

STEP 1:

Describe the catchment area including the affected estuary

STEP 2:

Identify and describe water users within the area of concern

STEP 3:

Review all water users:

- Registered users on the WARMS & eWULAAS
- Identify unregistered/Illegal users through local authorities (DWS, DFFE)

Phase 2: Planning & Assessment

STEP 1:

Relevant Specialist must conduct a hydrological study of the catchment in question

STEP 2:

Use Google Earth and other related tools to identify water users abstracting water in close proximity to estuaries

STEP 3:

Assess the WARMS & e-WULAAS on the permits, GAs/WULs given for the abstraction of water

STEP 4:

Conduct ground truthing with the relevant team of specialists to determine whether required amount of water is reaching the estuaries

Phase 3: Defining Rehabilitation Objectives

STEP 1:

Define clear rehabilitation objectives based on information gathered in **Phase 1 & 2**

Examples:

Some of the common objectives for rehabilitation are to control abstraction of water from catchments and prevent flow impediment impact and changes in flow drivers and hydrodynamics into the estuary

Phase 4: Execution (licensed user) (1)

STEP 1:

Ensure that each water user adheres to the abstraction limits set under the GA/WUL conditions, through continuous monitoring of abstraction volumes

STEP 2:

The quantity of water to be abstracted must be measured for reporting purposes and to avoid exceedance of the licensed volumes

STEP 3:

Ensure that Ecological Water Requirements are adhered to at all times

Phase 4: Execution (unlicensed users) (2)

STEP 1:

All water users without a GA/WUL must cease abstraction activities until they are granted a GA/WUL

STEP 2:

Non-compliance measures should be put in place for users who continue to abstract without a GA/WUL

STEP 3:

Once GA/WUL is granted, all users must adhere to the abstraction volumes stipulated as per the GA/WUL conditions

Phase 5: Monitoring & Evaluation

Monitoring

Evaluation

STEP 1:

- Regular monitoring will be required depending on the abstraction volumes according to the GA/WUL
- Unlawful abstraction observed during monitoring should be reported to the compliance and enforcement unit

Note: *This will assist in quantifying the volumes of water loss/gains. This will also aid in Flow Requirement and Water Resource Classification Studies*

STEP 2:

Monitor the following:

- Volume of abstractions
- Monitor the flows of the river vs. license abstraction volumes

STEP 1:

- Evaluate the effectiveness of interventions against achievement of rehabilitation objectives and outcomes
- Determine maintenance objectives

Geomorphology (1)

Identified Impacts

- **Sand mining**
- Erosion
- Dredging and dredging material disposal
- Human-induced sedimentation

Scenario 1: Rehabilitation of activities relating to **sand mining**, road construction & dredging

Note: *all these impact on biota, habitat, water quality and hydrology*

Phase 1: Diagnostic

STEP 1:

Use google earth images and desktop research to identify estuaries that are affected by sand mining

STEP 2:

Undertake ground truthing surveys or use drones to verify information provided by desktop research. Further information can be sourced from the DWS managers responsible for the catchment

Phase 2: Planning & Assessment

STEP 1:

In conjunction with Phase 1, establish the ecosystem status of that estuary (i.e, hydrology, water quality, habitat and biota) linked to different ecosystem services. Establish the extent and nature of the changes that have occurred.

STEP 2:

Identifying the main assets of the estuary and the threats to these, identifying why the system or a particular component of the ecosystem has been degraded for effective rehabilitation.

STEP 3:

Identify, screen & selecting candidate sites for rehabilitation based on the perceived threats with the aim to produce a list of sites and their related problems. This is applicable when causes of degradation are identified in more than one locality

STEP 4:

Set rehabilitation priorities considering how much funding is available & stakeholder vision

Phase 3: Defining Rehabilitation Objectives

STEP 1:

Define clear rehabilitation objectives based on information and data gathered in **Phase 1** and **2**

Examples:

Some of the common objectives are to:

- Improve the flow of estuaries which has been altered
- Prevent habitat degradation upon which biota depends

Phase 4: Execution

STEP 1:

Implement sustainable best practices and approaches for addressing impacts relating to mining and/or construction and dredging activities

STEP 2:

Based on best practices, recommend rehabilitation management strategies, which include areas of further research and skill requirements, areas of collaboration as well as aspects of monitoring

STEP 3:

Implement best practices in accordance to the applicable legislation e.g., NWA, NEMA, MPRDA

Phase 5: Monitoring & Evaluation

Monitoring

Evaluation

STEP 1:

Ensure appropriate regular monitoring of the rehabilitated areas

STEP 2:

Ensure that the rehabilitated areas comply with pre-determined critical limits

STEP 1:

- Evaluate the effectiveness of interventions against achievement of rehabilitation objectives and outcomes;
- Determine maintenance objectives

Geomorphology (2)

Identified Impacts

- Sand mining
- **Erosion & dune destabilization**
- Dredging and dredging material disposal
- Human-induced sedimentation

Scenario 2: Bank Erosion and Dune Rehabilitation

Phase 1: Diagnostic

STEP 1:

Identify estuaries affected by bank erosion and dune de-stabilisation

STEP 2:

Identify and determine the causes of movement, weathering and/or siltation of sand particles

STEP 3:

Conduct ground surveying with relevant authorities (municipal, conservation body as well as Provincial DWS & DFFE Offices) and make use of historic satellite imagery to inform changes and rate of changes

Phase 2.1: Planning Phase

STEP 1:

Consult relevant authorities (municipal, conservation body as well as Provincial DWS & DFFE Offices) in order to obtain buy-in from all stakeholders

STEP 2:

Identify areas that should be rehabilitated & the most appropriate method or combination of methods for rehabilitation as well as the related training and capacity needs

STEP 3:

Prepare an accurate estimate of the financial costs of rehabilitation and ensure that there are sufficient funds to achieve a successful outcome

Phase 2.2: Assessment Phase

STEP 1:

Conduct an Environmental Impact Assessment on the proposed erection of structures within the Estuarine Functional Zone (EFZ)

STEP 2:

- Assess the severity of the bank erosion and dune destabilization
- Assess present and future human activities in the area that might impact erosion and siltation in the estuary
- Assess the potential and nature of extreme events
- Conduct future climatic conditions and weather patterns

STEP 3:

Assess the degree of maintenance that would be practical for the selected method or combination thereof

Phase 3: Defining Rehabilitation Objectives

STEP 1:

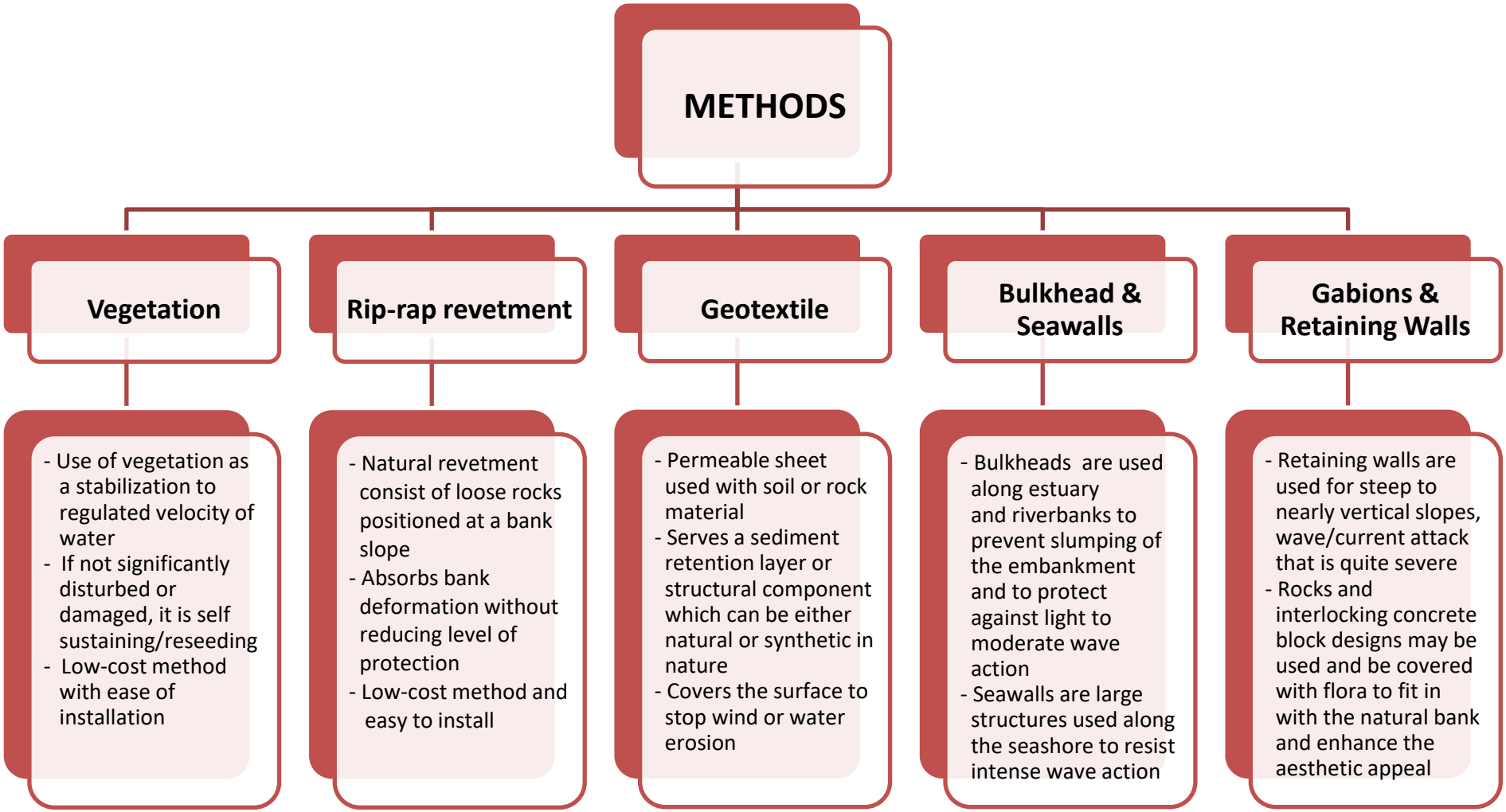
Define clear rehabilitation objectives based on information and data gathered in **Phase 1** and **2.**

Examples:

Some of the common objectives are to:

- Create space in which to address bank erosion by managing eroding banks and sites and reaches where down-cutting or incising occurs
- Prevent erosion
- Prevent dune destabilisation
- Revitalise the natural regime of the estuary and allow natural erosion of sediments that otherwise accumulate against encroaching alien plants.

Phase 4: Execution



Phase 5: Monitoring & Evaluation

Monitoring

STEP 1:

Ensure appropriate regular monitoring of the rehabilitated area

Evaluation

STEP 1:

- Evaluate the effectiveness of interventions against achievement of rehabilitation objectives and outcomes
- Determine maintenance objectives

DISCUSSION

Water Quality

Identified Impacts

- **Wastewater Treatment Works (WWTWs) & Industrial effluent discharges**
- Effluent discharge from surface and agricultural runoff
- Deforestation
- Climate Change Effects

Scenario 1: Rehabilitation of effluent discharge from WWTWs and Industries

Phase 1: Diagnostic Phase

STEP 1:

Undertake a desktop assessment to identify the WWTWs & industries whose effluent is impacting water quality of the estuaries (i.e., facilities situated 5km-10km away from an estuary).

STEP 2:

Request historical water quality data and/or incident reports from relevant authorities (for water quality trends and patterns)

STEP 3:

Initiate communications with the responsible authorities (i.e., WWTWs & industries personnel, municipal as well as Provincial DWS & DFFE Offices)

STEP 4:

Utilize tools such as Google Earth/Engine, satellite imagery, GIS and Remote Sensing to pinpoint changes in land use (land-based catchment pollution that could be associated with changes in the quality of water)

STEP 5:

Conduct ground truthing to identify visible signs of water quality changes such as extremely foul odour, dead fish, loss of biodiversity in the estuary

Note:

This phase must consider the following factors:

- The overall integrity and functioning of the WWTWs & industrial facilities
- Challenges associated with power cuts and failures
- Land based activities and the overall management of the catchment

Phase 2.1: Planning Phase

STEP 1:

Request local government officials (municipal as well as Provincial DWS & DFFE Offices) and community forums responsible to assist with identifying point sources of pollution to provide guidance on available regulatory processes

STEP 2:

Investigate other sources of pollution and water quality e.g. non-point sources of pollution

Phase 2.2: Assessment Phase

STEP 1:

- Collect the actual final effluent water samples from the sources i.e., WWTW & industrial facility
- Collect representative water quality samples from the resource i.e., Estuary:
  - 1 upstream of the WWTW & industrial facility discharge points,
  - 1 downstream of the WWTW & industrial facility discharge points
- Have samples analysed at an accredited laboratory to determine the water quality at the sources and resource, respectively.

STEP 2:

- Compare laboratory-generated water quality data to the expected state for the identification of areas of concern
- Data analysis should be compared against the RQOs/RWQOs, or water quality standards if they have not yet been established for that catchment

Phase 3: Defining Rehabilitation Objectives

STEP 1:

Define clear rehabilitation objectives based on information and data gathered in **Phase 1** and **2.**

Example:

Common objective are to manage and prevent poor effluent from WWTWs & industrial facilities from discharging into water resources i.e., Estuaries

Phase 4: Execution

STEP 1:

Implement environmentally sustainable solutions through stakeholder engagements, communication within water sector & between government departments

STEP 2:

- Ensure treatment of effluent from point sources prior to discharge
- Effluent which does not meet the discharge standards should be temporarily stored for further treatment
- Monitor the effluent before discharge to ensure that it is of acceptable quality standard

STEP 3:

- Implement surface water management around the WWTWs & industrial facilities
- Install cut-off trenches around the facilities to separate clean and dirty water and direct clean water back into natural drainage lines and the natural environment
- The dirty water channels should drain to an emergency holding dam for treatment

STEP 4:

Construct temporary berms along the estuary to prevent further offsite migration/discharge of effluent ending into the estuary

Phase 5: Monitoring & Evaluation

Monitoring

Evaluation

STEP 1:

- Undertake regular water quality monitoring in the estuary depending on the volume discharge, local municipal by-laws and the type of permit allowed
- Continuously monitor WWTWs & industrial facilities to assist with defining the quality of the water and extend to which treatment is required (records of up to a year are desirable to characterise the state of the facilities)

STEP 2:

Monitoring parameters for WWTWs:

- Nutrients, bacteria (*E.coli* or *coliforms*)

Monitoring parameters for industries:

- Metal concentrations and distributions at least once every 3-5 years for industrial facility
- Metal concentrations in tissues of fish/mussels (bio-accumulation) at least once every 3-5 years

STEP 1:

- Evaluate the effectiveness of interventions against achievement of rehabilitation objectives and outcomes;
- Determine maintenance objectives

Habitat (1)

Identified Impacts

- **Alien Invasive Species**
- Habitat removal and alteration
- Estuary Mouth Breaching
- Sand mining
- Dredging activities
- Climate change

Scenario 1: Control and Management of Alien Invasive Species

Phase 1: Diagnostic Phase

STEP 1:

Identify areas infested by Alien Vegetation

STEP 2:

At a desktop level, employ tools such as Google Earth & Remote Sensing to identify infested areas

STEP 3:

Use tools in **Step 2** to describe in detail the infested areas i.e., visual description, catchment vs. sub-catchment area, extent of infestation & conditions upstream & downstream of affected area

STEP 4:

Based on **Step 1-3**, identify the areas of Alien Vegetation of concern i.e., Riparian and Non-Riparian
Categorize Alien Vegetation types i.e., Short trees (1.5-2m) Tall trees (2-2.5m) & Tall Shrubs (>2.5)

Note:

- ✓ Other examples of known aquatic species include water hyacinth, water Lettuce, and kariba weed
- ✓ Other examples of known vegetation species include climbers, creepers, grasses, and reeds

Phase 2: Planning & Assessment

STEP 1:

Conduct a site visit to accurately confirm and ascertain the preliminary findings acquired in the Diagnostic Phase

STEP 2:

Consider the below aspects when undertaking fieldwork:

- Photographs and GPS co-ordinates
- Details relating to the calculation of estimated hectare of the infested areas

STEP 3:

Follow the below steps during planning and assessment:

- Identify priority invasive plant species for control and clearing
- Identify sensitive indigenous vegetation that should be protected during clearing operations
- Mark individual species of vegetation to guide workers on-site during clearing and prevent accidental damage
- Identify the most appropriate clearing method or combination of methods
- Identify approaches and areas for the disposal of cleared material

Phase 3: Defining Rehabilitation Objectives

STEP 1:

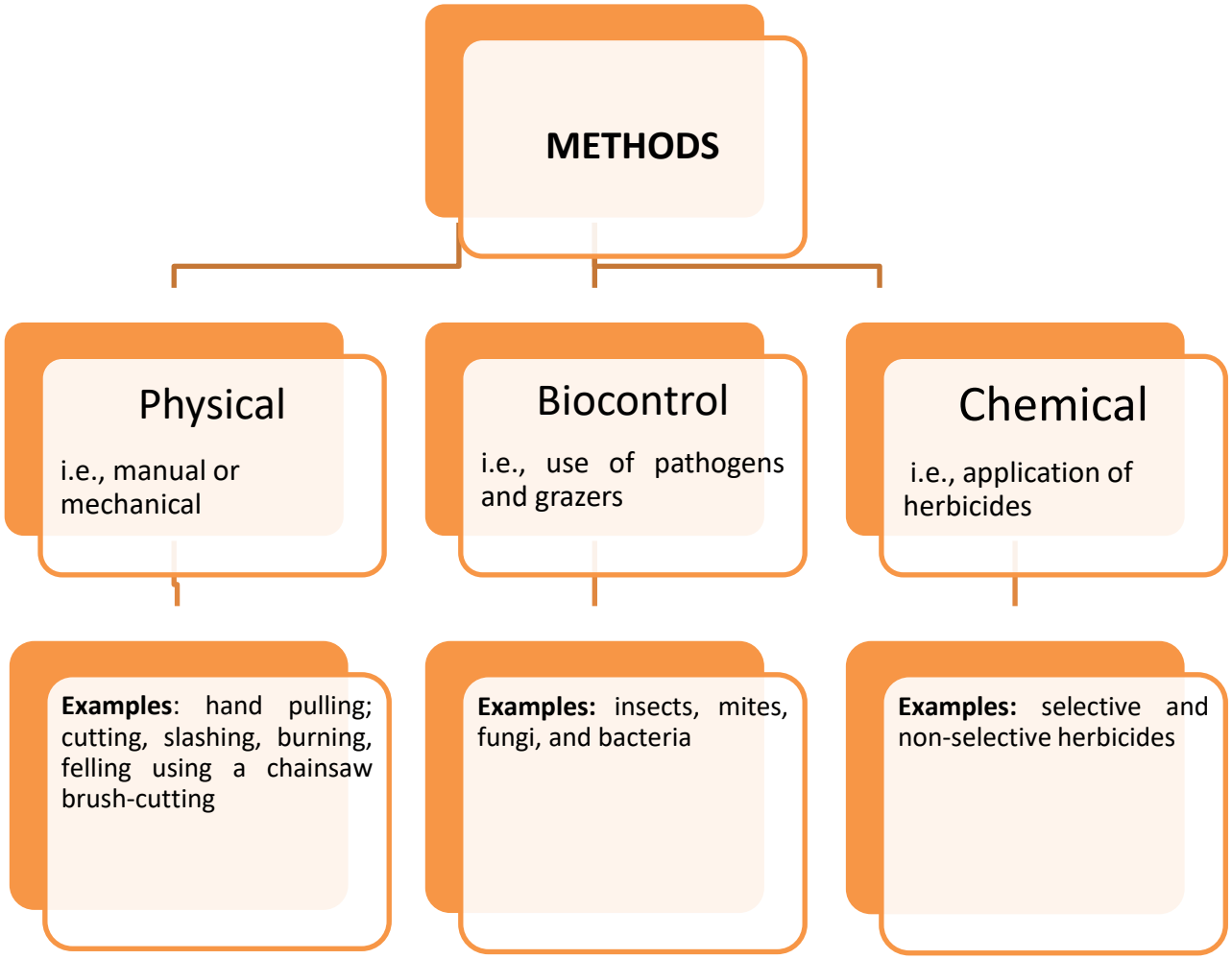
Define clear rehabilitation objectives based on information gathered in **Phase 1 & 2**

Examples:

Some of the common objectives for Alien Vegetation clearing are to:

- Increase space for flood alleviation by clearing vegetation
- Improve biodiversity of natural indigenous estuarine flora
- Revitalise the natural regime of the estuary and allow natural erosion of sediments that otherwise accumulate against encroaching alien plants

Phase 4: Execution Phase



Phase 5: Monitoring & Evaluation

Monitoring

Evaluation

STEP 1:

Conduct site visits to ensure the treatment methods employed are adequate and require no further additional measures

STEP 2:

- Compile fixed point photographic record showing the affected area before and after treatment
- Use historical google images to observe spatial records of extent and effects

STEP 1:

- Evaluate the effectiveness of interventions against achievement of rehabilitation objectives and outcomes
- Determine maintenance objectives

Habitat (2)

Identified Impacts

- Alien Invasive Species
- **Habitat removal and alteration**
- Estuary Mouth Breaching
- Sand mining
- Dredging activities
- Climate change

Scenario 2: Management of excessive habitat removal/alteration

Phase 1: Diagnostic Phase

STEP 1:

Acquire zonation maps from the relevant authority to identify the extent of habitat alteration

STEP 2:

Identify the most impacted habitat(s) for example overutilization of raw material (e.g., reeds, sedges and mangroves in that particular estuary)

STEP 3:

Undertake a desktop analysis to evaluate impacts (as a result of human activities such as historic agriculture activities, illegal recreational and tourism developments, mangrove cutting and current sand mining operations)

Phase 2: Planning & Assessment

STEP 1:

- Undertake an assessment to understand the conservation value of the estuary

STEP 2:

- An Estuary Protected Zone (as demarcated in the zonation map) would incorporate a variety of habitats (inter and supratidal salt marsh, sandbanks and mudbanks) and any species would be closed to all forms of human disturbance – specific to each estuary

STEP 3:

Establishing a feasibility plan, including the identification of reference ecosystems or reference models and derived targets

Phase 3: Defining Rehabilitation Objectives

STEP 1:

Define clear rehabilitation objectives based on information gathered in **Phase 1 & 2**

Examples:

Common objectives for habitat rehabilitation are to:

- Protect indigenous estuarine vegetation
- Implement mitigation measures such as bank stabilization
- Restore topographical sequences

Phase 4: Execution Phase

STEP 1:

Consult all relevant authorities and ensure that you have acquired all the necessary information pertaining to the requirements and all the legal mandates are complied with.

STEP 2:

Identifying funding sources and securing funding, including considering linking ecosystem service outcomes to beneficiaries and targeting funding opportunities linked to ecosystem service outcomes

STEP 3:

Establishing project management systems including the technical approaches

STEP 4:

Undertaking restoration, including with community volunteers, citizen science members and contractors

Phase 5: Monitoring & Evaluation

Monitoring

Evaluation

STEP 1:

Rehabilitation of estuarine habitats requires time and vigilance to allow the cumulative effects of smaller projects to emerge and larger scale natural processes to re-establish themselves

STEP 2:

- Once objectives for restoration have been set, having a monitoring programme in place will assist with assessing the changes taking place in the estuary in response to measures undertaken to transform that particular estuary
- It is, therefore, important that monitoring be started as soon as this exercise commences. The monitoring programme should be developed during the assessment phase

STEP 1:

- Evaluate the effectiveness of interventions against achievement of rehabilitation objectives and outcomes
- Determine maintenance objectives

Habitat (3)

Identified Impacts

- Alien Invasive Species
- Habitat removal and alteration
- **Estuary Mouth Breaching**
- Sand mining
- Dredging activities
- Climate change

Scenario 3: Estuary Mouth Breaching

***Note**: mouth opening or closure affects the migration of biota*

Phase 1: Diagnostic

STEP 1:

- Describe the catchment area or estuary of concern
- Use tools such as Google Earth/Engine, satellite imagery, GIS and Remote Sensing to identify estuaries that are affected by sand berms depriving freshwater flow

STEP 2:

Identify and describe water obstruction on the watercourse that might hinder the natural breaching of the mouth

STEP 3:

Understand sediment dynamics using Google Earth or related sources

STEP 4:

Determine whether a **planned** or **emergency** breaching is required

Planned Breaching

- Undertaken when the estuary experiences high water levels or at the frequency that is necessary for the protection of infrastructure and ecosystem functioning
- Triggers NEMA: EIA Regulations
- Conducted periodically *i.e.,* every two years or less

Emergency Breaching

- Undertaken due to conditions that develop when an estuary mouth is closed/constricted and severe rainfall occurs in the catchment causing a large flood
- Triggers NEMA: S30A Regulations
- Conducted once-off

Phase 2.1: Planning & Assessment (Planned Breaching)

STEP 1:

- Consult relevant authorities (municipal, conservation body as well as Provincial DWS & DFFE Offices)
- At desktop level, employ remote sensing to assess the extent of the problem as well as estuarine field surveys. This activity needs to be done in conjunction with information from Step 1 of Phase 1 to avoid duplication of efforts

STEP 2:

Assess whether impacts are due to natural or anthropogenic factors using estuarine indices

STEP 3:

Determine estuarine conditions, which will provide an indication on the extent and type of rehabilitation that is needed for the estuary. There are different indices which are employed at various levels of aggregation, that is, **estuary ecosystem condition indicators**, **estuary health index** & **national estuarine ecosystems condition index** (Van Niekerk *et. al,* 2020)

Phase 2.2: Planning & Assessment (Emergency Breaching)

STEP 1:

- A written request to breach, in terms of NEMA section 30A should be directed to the Provincial DFFE Office
- The request should be accompanied by photographs of the status quo of the estuary

STEP 2:

- Where reasonably possible, a site inspection must be undertaken by the Provincial DFFE Office to verify the information received
- The site inspection may consist of a team coordinated by the Provincial DFFE Office which involves all the affected authorities

STEP 3:

Once the status quo of the estuary has been confirmed by the Provincial DFFE Office, a decision/written directive regarding the commencement of the requested activity (*i.e.,* emergency breaching) should be issued

Note:
While breaching should be conducted according to a Mouth Management Plan (MMP) in support of an Estuarine Management Plan (EMP), some of the general breaching principles may be waivered under emergency conditions to ensure practical breaching

Phase 3: Defining Rehabilitation Objectives

STEP 1:

Define clear rehabilitation objectives based on information gathered in **Phase 1 & 2**

Examples:

Some of the common objectives to:

- Maintain the estuarine biodiversity
- Prevent ecological degradation
- Improve the overall functions of estuaries

Phase 4: Execution

PLANNED BREACHING PROCEDURE (Step 1 to 4)

STEP 1:

- Develop a Mouth Management Plan (MMP) in support of an Estuarine Management Plan (EMP) to provide information of the methods and mechanisms of breaching suitable to a specific estuary
- Consult the EMP if readily available for the estuary of concern

STEP 2:

Breaching should be conducted under the following conditions:

- When the water level is at the highest which increases the flushing rates of sediments
- During periods of high waves which promote an influx of sediments, depending on site specific climate
- At high tide to maximise outflow

STEP 3:

- The following steps needs to be followed:
  - Select appropriate location for breaching, using historic images.
  - Consider public safety and animal mobility during breaching. Breaching should ideally be done in the late afternoon or early morning for safety reasons
  - Excavated trenches should be reasonable in size depending on the size of the sand berm. The aim is to lose all the excess water in the estuary
  - Excavated sand must be sent back to the ocean and not be left on the sides of the breached mouth

STEP 4:

- Excavate a deep trench (about 2m in depth & 3-4m in width) before breaching to maximise outflow – unless site specific conditions dictate otherwise
- Sediment taken out would have to be moved to the ocean

EMERGENCY BREACHING PROCEDURE (Step 3-4)

Phase 5: Monitoring & Evaluation

Monitoring

Evaluation

STEP 1:

Monitoring needs to focus on **water levels** and **mouth observations**

STEP 2:

Monitoring should be an ongoing activity that must be undertaken pre, during and post the breaching

STEP 1:

- Evaluate the effectiveness of interventions against achievement of rehabilitation objectives and outcomes
- Determine maintenance objectives

Biota (1)

Identified Impacts

- **Sand mining, dredging & dredging material disposal, in-stream infrastructure creating barriers and preventing biota migration**
- Over-exploitation / Overfishing
- Water Quality

Scenario 1: Re-establishment of biota migratory routes

Sand mining, dredging & dredging material disposal, in-stream infrastructure and sedimentation processes & patterns have the following impacts on biota:

- Disrupts biota migration routes
- Disturbs the spawning, feeding, dispersion and colonisation of biota
- Changes the flow dynamics of the estuary

IMPACTS

INTERVENTIONS

Implementation of the following techniques/methods:

- Estuary Mouth Breaching outlined under Scenario 3 for Habitat
- Removal/rehabilitation of physical structures outlined under Scenario 1 for hydrology
- Rehabilitation of activities relating to sand mining & dredging outlined under Scenario 1 for Geomorphology

Biota (2)

Identified Impacts

- **Sand mining, dredging & dredging material disposal, in-stream infrastructure creating barriers and preventing biota migration**
- Over-exploitation / Overfishing
- Water Quality

Scenario 2: Control and Management measures to prevent overfishing

Overfishing impacts are as follows:

- Eradication of marine and coastal life
- Financial losses for smaller scale fisherman and their families
- Loss of a food source for poorer coastal communities

IMPACTS

INTERVENTIONS

Implementation of the following techniques/methods:

- Implement sustainable fishing methods such as hook and lining
- Apply strict regulations/by-laws on fishing techniques/methods
- Raise awareness on appropriate fishing methods through education, training and sharing of knowledge

THANK YOU

Project website:
https://www.dws.gov.za/RDM/SDCCO.aspx