Western Cape Government

ECOLOGICAL INFRASTRUCTURE INVESTMENT FRAMEWORK: IMPLEMENTATION AND MONITORING PLAN

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ECOLOGICAL INFRASTRUCTURE INVESTMENT FRAMEWORK: IMPLEMENTATION AND MONITORING PLAN

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Authors:

P. Ntshotsho and D. Le Maitre

With input from M. Audouin, G. Forsyth and Melanie Luck-Vogel,

(all from CSIR)

Team Responsible for Project:

Western Cape Government, Department of Environmental Affairs and Development Planning, Biodiversity Management

Marlene Laros

Albert Ackhurst

Faith Chihumbiri

John Wilson

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"Bookshelves around the world are laden with written plans. Having spent a brief time in the limelight, each now rests unimplemented and often forgotten."

(Jon Kohl, 2006)

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LIST OF ACRONYMS

Acronyms	Definitions
AFIS	Advanced Fire Information System
CMA	Catchment Management Agency
CSIR	Council for Scientific and Industrial Research
DEA&DP	Department of Environmental Affairs and Development Planning
DEFF	Department of Environment, Forestry and Fisheries
DEFF-NRM	Department of Environment, Forestry and Fisheries-Natural Resource Management Programmes
DHSWS	Department of Human Settlements, Water and Sanitation
DLG	Department of Local Government
DMC	Western Cape Disaster Management Centre
DoA	Western Cape Department of Agriculture
DWS	Department of Water and Sanitation
EI	Ecological Infrastructure
EIIF	Ecological Infrastructure Investment Framework
FPAs	Fire Protection Associations
IAPs	Invasive Alien Plants
IAS	Invasive Alien Species
IDP	Integrated Development Plan
IFM	Integrated Fire Management
IMP	Implementation and Monitoring Plan
MAR	Mean Annual Runoff
MUCP	Management Unit Control Plan
NRM	Natural Resources Management
SAEON	South African Environmental Observation Network
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SDF	Spatial Development Frameworks
TNC	The Nature Conservancy
WC	Western Cape
WCG	Western Cape Government

LIST OF TERMINOLOGY		
TERM	**DEFINITION**	**SOURCE**
Catchment	A catchment is defined as the area from which any rainfall will drain into a watercourse through surface flow to a common discharge point.	National Water Act No. 36 of 1998
Coastal management lines	A line determined by the MEC in accordance with section 25 of the Integrated Coastal Management (ICM) Act in order to demarcate an area within which development will be prohibited or controlled in order to achieve the objects of the ICM Act or coastal management objectives.	DEA&DP, 2016
Ecological infrastructure	"Naturally functioning ecosystems that deliver valuable services to people, such as water and climate regulation, soil formation and disaster risk reduction. It is the nature-based equivalent of built or hard infrastructure, and can be just as important for providing services and underpinning socio-economic development. Ecological infrastructure does this by providing cost effective, long-term solutions to service delivery that can supplement, and sometimes even substitute, built infrastructure solutions. Ecological infrastructure includes healthy mountain catchments, rivers, wetlands, coastal dunes, and nodes and corridors of natural habitat, which together form a network of interconnected structural elements in the landscape."	South African National Biodiversity Institute (SANBI), 2019
Ecological restoration	Ecological restoration is "the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed."	Society For Ecological Restoration, 2019
Ecological rehabilitation	Rehabilitation emphasizes the reparation of ecosystem processes, productivity and services, whereas the goals of restoration also include the re-establishment of the pre-existing biotic integrity in terms of species composition and community structure. The goal of rehabilitation projects is not native ecosystem recovery, but rather reinstating a level of ecosystem functioning for renewed and ongoing provision of ecosystem services potentially derived from non-native ecosystems as well.	Society For Ecological Restoration, 2004 Society For Ecological Restoration, 2019
Fire regime	The pattern of fire occurrence over an extended period in a given area, defined as the typical frequency, seasonality, intensity, and size of fires.	Gill & Allan, 2008
Home ignition zone	An area within 30 m of a house, including the garden and potentially also neighbouring properties	Ager et al., 2012
Integrated Fire	"Integrated fire management, is the development and implementation of mitigation measures, standards and	Wessels and Wolf, 2009: 4

LIST OF TERMINOLOGY		
TERM	**DEFINITION**	**SOURCE**
Management (IFM)	prescriptions based on comprehensive risk assessment, and aimed at reducing the negative impacts of veld and forest fires on social, economic and environmental assets. It is a process of continual improvement, involving record keeping, monitoring, measurement and modification. Integrated fire management also implies co-operation and coordination between all role players in the fire prone environment."	
Land degradation	"Land degradation can be considered in terms of the loss of actual or potential productivity or utility as a result of natural or anthropic factors; it is the decline in land quality or reduction in its productivity."	Esweran *et al.*, 2001
Monitoring	"A continuing function that uses systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing development intervention with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds."	Public Service Commission, 2008
Pyrodiversity	The outcome of the trophic interactions and feedbacks between fire regimes, biodiversity and ecological processes	Bowman *et al.*, 2016
Water security	Water security is defined as "the reliable availability of an acceptable quantity and quality of water for health, livelihoods and production, coupled with an acceptable level of water-related risks."	Grey and Sadoff, 2007
Wildland - urban interface	A wildland–urban Interface "refers to the zone of transition between wildland (unoccupied land) and human development. It is the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels."	National Wildfire Coordinating Group, 2019

1. PURPOSE AND SCOPE OF THE IMPLEMENTATION AND MONITORING PLAN

The Ecological Infrastructure Investment Framework (EIIF) for the Western Cape (DEA&DP, 2021b) seeks to advance, facilitate and align investments in Ecological Infrastructure (EI) in the Western Cape Province. The aim of these investments, derived from a consultation process with a wide group of stakeholders and organisations across the province, is to achieve the EIIF's vision for ecological infrastructure (EI), which is as follows:

> *"By 2040, people of the Western Cape live and organise themselves in a way that promotes healthy and resilient ecological infrastructure, so that it yields goods and services that support physical, psychological and spiritual well-being in the face of population pressure, rapid urbanisation and climate change."*

The EIIF sets out four strategic objectives to **guide** decision-makers from the public and private sector in making choices on **where and how** to invest **in order to promote the resilience** of the Western Cape's EI. Consequently, the purpose of this accompanying Implementation and Monitoring Plan (IMP) is to enable the evaluation of the overall effectiveness of the EIIF, as well as to enable decision-makers and investors to track how investment is contributing to the resilience of EI in the Western Cape over time. It supports the realisation of the vision and objectives of the EIIF by identifying critical actions to be undertaken to achieve the stated vision. Furthermore, it seeks to enable: (a) monitoring and evaluation of the role of the EIIF in attracting and guiding investment in EI; and (b) reporting on the effectiveness of investment into EI, with specific reference to investment guided by the vision and investment objectives of the EIIF.

One of the components of the EIIF project was an Alien Invasive Species Strategy (AISS) discussion document, which sets out a provincial level strategy for the management of Alien Invasive Species and is aligned with the proposed national invasive species strategy (DEA&DP, 2021a). There is close alignment between the vision of the EIIF and the AISS, particularly the EIIF's strategic objectives of addressing the threats posed to water security, wildfire management, and rangeland productivity through *inter alia* alien species invasions. This IMP therefore incorporates some measures aimed at tracking the development of a provincially endorsed AISS and its implementation. The indicators for Investment objectives 1 and 2 will report on the status of established invasions and control measures being taken, which is an important component of the AISS.

2. GENERAL APPROACH TO THE DEVELOPMENT OF THE IMPLEMENTATION AND MONITORING PLAN

National Treasury has developed the Framework for Managing Programme Performance Information (National Treasury, 2007) to guide government-wide performance monitoring and evaluation. The framework lists different categories of indicators that can be used to track performance, on a continuum from inputs to impacts (Figure 1). Inputs, activities and outputs can be regarded as indicators of implementation. They are generally used to answer the question: "Are we doing what we are meant to be doing?" The widespread use of such indicators has been extensively criticised, because it can lead to the confounding of successful implementation with effectiveness or achievement of stated goals (Alexander & Allan, 2007; Holmes et al., 2008; Ntshotsho et al., 2011). In contrast, indicators of outcomes and impacts seek to answer whether the actions undertaken achieved the desired effect. The choice of

which types of indicators to use depends on the reporting requirements. As such, care should be taken to choose indicators that are fit-for-purpose and are useful from an accountability perspective. Additionally, for the purposes of this IMP, it is important to define practicable indicators that can be readily owned by the relevant partners/stakeholders.

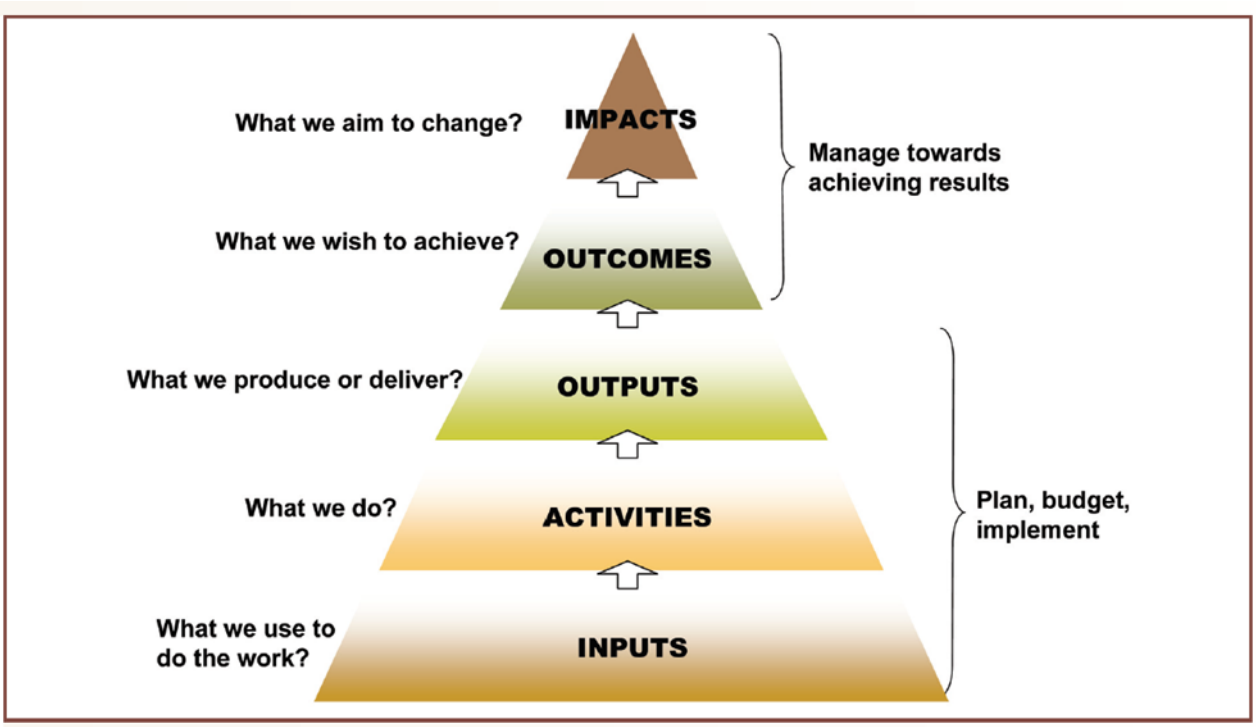

Figure 1: Broad performance indicator categories (Source: National Treasury, 2007).

The investment objectives identified in the EIIF are associated with key strategic actions (KSAs, see Appendix 1). However, most of the KSAs are not easily actionable or directly measurable. Thus, our approach to developing the IMP focused on selecting those KSAs that were deemed practicable, and rephrasing them as headline indicators. These headline indicators were mainly descriptive in nature and meant to articulate the ideal state for each investment objective. Specific actions were then determined, which, in concert, are intended to contribute to the attainment of the ideal state. Key stakeholders were named as responsible for the execution of each action. We also identified mainly quantitative indicators to assist with the tracking of progress towards the achievement of targets. Lastly, assumptions upon which the occurrence of each activity is based were stated. These are a combination of conditions that need to be fulfilled in order to implement, and potential barriers to or enablers of implementation. An overarching assumption is that DEA&DP will take the lead in the implementation of the EIIF, including collating information from and coordinating interactions with and among role-players identified as responsible for specific activities in the IMP.

In identifying indicators and activities, existing implementation tools, initiatives and reporting platforms such as the Western Cape Government Environmental Implementation Plan (DEA&DP, 2015); Provincial Biodiversity Economy Strategy (DEA&DP, 2016a); the Provincial Biodiversity Strategy and Action Plan (DEA&DP, 2016b); Western Cape Coastal Management Programme (DEA&DP, 2016c); the National Water and Sanitation Master Plan (DWS, 2018); the Western Cape Sustainable Water Management Plan 2017-2022 (DEA&DP, 2018); the Greater Cape Metro Regional Spatial Implementation Framework (DEA&DP, 2019) and the Western Cape Veld Fire Plan 2019-20 (WCG, 2019) were consulted, among others. In addition, and in keeping with the Western Cape Provincial Department's emphasis on joint

planning and implementation, the plan was developed through a process of consultation with a working group that comprised key stakeholders who were identified as key partners for implementation.

3. DETAILED IMPLEMENTATION AND MONITORING PLAN

A two-tiered approach was followed when structuring the IMP, wherein a distinction was made between assessing the impact of the EIIF at a strategic level, and tracking and monitoring the contribution of individual investments to the investment objectives at that investment level, for example, per catchment or project. The former thus seeks to answer whether the EIIF is resulting in enhanced investment in EI, and whether these investments, in turn, are promoting/increasing the resilience of EI in the Western Cape. This focuses on the coordination and implementation role of DEA&DP at a strategic level. In contrast, the investment-level focus of the second tier seeks to assess whether and how individual interventions/investments are contributing to any of the investment objectives of the EIIF. At this level, emphasis is on on-the-ground implementation, and specific activities, targets and indicators that can be aggregated to inform higher-level reporting. Sections 3.1 and 3.2 below provide a detailed narrative of the approach.

3.1 Strategic level implementation and monitoring

At the strategic level, DEA&DP will play a leading role in the following:

(i) Ensuring that the objectives and restoration priorities of the EIIF are adopted internally and by other departments in the WCG, especially Agriculture, Disaster Management Centre (a component of Local Government), Economic Development & Tourism, Transport & Public Works and Local Government.

(ii) Working with municipalities to ensure that the EIIF objectives and restoration priorities are incorporated into District Municipality IDPs and SDFs, beginning with those where the priority catchments are located.

(iii) Ensuring that the EIIF is actively promoted as the preferred framework for non-government investment in EI via the WCG websites, other media and through partnerships with stakeholders.

(iv) Establishing a baseline for existing investment in EI against which future investment, particularly that coming via the EIIF, can be measured. Initially this should be collated for the priority catchments identified by the EIIF (target for year one) with the aim of having a province–wide database which can also guide future investment (target for year five).

(v) Addressing the development and adoption of the AISS objectives by the WCG, and the achievement of measures set out in the AISS and linked to the strategic objectives of the EIIF.

To guide implementation and monitoring at the programme level, core themes, desired outcomes, key actions and means of measuring are listed in Table 1.

Table 1: Strategic (programme) level implementation and monitoring plan to assess whether or not the EIIF is influencing and aligning investment in EI in the Western Cape.

Core theme	Outcome	Action	Measure
Increased investment in EI.	By 2030 there is significant improvement in investment in EI projects across the province, by both the public and private sectors compared to the baseline.	(i) Establish a baseline of the value of current investment, as well as the identity of the investors within the first year of implementing the EIIF. (ii) Maintain a database of investment in EI, particularly investment stimulated by the EIIF. (iii) (iii) Maintain a record of activities and engagements undertaken to promote the EIIF.	Change in investment value over time.
Improved collaboration and coordination.	Adoption and promotion of the EIIF and its priorities by other key WCG departments, particularly Agriculture, Economic Development & Tourism, as well as National Government.	(i) Produce and continually update a stakeholder map of WCG departments engaged in the uptake of the EIIF. (ii) Collaborate with similar prioritising exercises on the landscape to promote synergies. (iii) Negotiate and enter into collaborative agreements between role players where necessary.	Change in number and strength of stakeholder connections and interactions (i.e. record of meetings and key outcomes).
Widespread adoption of EIIF objectives and restoration priorities.	By 2025 the objectives and priorities of the EIIF are incorporated into District Municipalities' IDPs and SDFs, in order to guide future investment.	(i) In the short-term (year 1-3) collate information on the extent to which IDPs and SDFs of municipalities in the priority catchments incorporate the objectives and restoration priorities of the EIIF. (ii) In the medium to long term, establish and maintain a province-wide database of adoption.	Number of municipalities using the EIIF priorities. Number of EI investments utilising the EIIF vs the number of EI projects.
Coordinated reporting.	All EI improvement interventions funded through the EIIF track and report progress using a common framework that, in turn, can aggregate indicators for strategic-level reporting.	(i) Ensure that new investments commit to using the approved implementation and monitoring framework for each of the investment objectives. (ii) Design and maintain an online system for use by project managers to report on progress.	Number of data inputters utilising the database vs number of stakeholders involved in EI.
Improved EI resilience	By 2040 the EI of the Western Cape is more resilient, compared to the baseline.	(i) Adopt a relevant framework to measure EI resilience, incorporating the indicators used at project-level (Table 2). (ii) In the short-term, establish a baseline for EI resilience, using the chosen framework.	

Core theme	Outcome	Action	Measure
		(iii) At appropriate intervals, conduct resilience assessments.	
Alien Invasive Species Strategy	By 2022 there is a provincial IAS strategy which guides IAS management actions within the Western Cape.	(i) Participate AISS discussion document with key role players to elevate it to the level of a provincial strategy. (ii) Identify actions around the AISS that would need to be undertaken and develop an Action Plan for the AISS.	

3.2 Investment level implementation and monitoring

The EIIF lists four investment objectives, and this component of the IMP is meant to enable DEA&DP to transform the EIIF into action, to achieve these objectives in a demonstrable manner. The objectives are:

1) **To improve water quality and quantity** in support of people's health and livelihoods in the Province, by controlling the threat of alien invasive plants specifically and improving the ecological status of rivers, wetlands and estuaries more generally.

2) **To reduce the vulnerability** of people, property and the environment **to the threat of uncontrolled wildfires**.

3) To sustainably support local livelihoods and food supply provided by the Province's rangelands through **improved land management practices**, particularly relating to grazing.

4) **To reduce the exposure** of communities, infrastructure and economic activities **to the impacts of increased flooding** within the catchment and along the coast.

While the initiative to develop an EIIF originated within the Biodiversity and Coastal Management Directorate of DEA&DP, the intention is to ensure that the EIIF becomes a transversal initiative within the Western Cape, co-created by all the key government agencies involved in EI investment. This is in recognition of two main issues: (a) the fact that the management and restoration of EI is an integral part of the mandates of other Directorates within DEA&DP and other provincial departments, especially Agriculture, Local Government (including Disaster Management), and Tourism & Economic Development; and (b) that effective management and restoration of EI requires a holistic approach which recognises that EI is an interconnected system. For example, the state of a water resource depends on how the land generating that water is managed. The nature of EI as a system is also reflected in the investment objectives of the EIIF, which are interdependent although they focus on specific benefits to society: protecting and restoring EI for improved water flow and quality; reducing wildfire risks; restoring rangelands; and reducing flood risks, both inland and along the coast. Investments aimed at achieving these objectives need to be cognisant of the impacts of climate change on floods and wildfire risk.

Governmental responsibility for EI also spans the spheres of government, with the environmental matters involving all spheres, and agricultural matters being both national and provincial. Water resource management is somewhat different in that water resource protection and planning currently are a national responsibility but water services are a local authority responsibility. There are also Catchment Management Agencies, which have already taken on some national functions and are in the process of taking on responsibility for water resource planning at the Water Management Area level, which sometimes includes more than one province. Key foci of the EIIF are on reducing the impacts of alien plant invasions on water security and on wildfire risks through the management of invasive alien species (IAS), with a focus on plant species as described in the Alien Invasive Species Strategy (DEA&DP, 2021a). IAS legislation is a national responsibility so its enforcement is not a provincial responsibility, but all organs of state are required by the legislation to develop, implement and report on progress on IAS management plans on their land holdings, and so also are private land owners. This means, for example that all provincial departments with land holdings require these plans and reporting systems. The implementation of legislation relating to veldfire management is the responsibility of national DEFF, but the development and implementation of veldfire management plans, including fire hazard and fire risk

reduction, is the responsibility of Fire Protection Associations (FPAs), in partnership with the District Municipal Disaster Management staff responsible for veld fire management (e.g. the chief fire officer) under the National Veld and Forest Fire Act (Act 101 of 1998). The Western Cape Disaster Management Centre (Department of Local Government) has been established to plan and coordinate all disaster management activities in an integrated manner. This gives the Department of local Government (DLG) a key role in overseeing wildfire risk management, especially in the prevention of wildfire related disasters, preparedness and disaster response at the local government level. DLG also has a key role, together with Spatial Planning (DEA&DP), in ensuring that municipalities take flood risk and coastal erosion into account in their spatial planning and disaster management.

The national Department of Environment, Forestry and Fisheries' NRM (DEFF-NRM) programmes are a major source of funding for IAS management and for EI restoration in the Western Cape. Accordingly, improving alignment between their priorities and the EIIF's priorities should be a component of the IMP. The DoA has a LandCare programme that has appointed contractors and implemented alien clearing, in addition to supporting IAP management by farmers. These initiatives should also be aligned or coordinated with investments in IAP management that are initiated through the EIIF.

In addition to government entities involved in the management of IAS, an increasingly prominent role is being played by civil groups and private landowners, who are recognising the return on investment, specifically in terms of water, that arises from investing in EI. Such involvement is essential as the government does not have sufficient resources to successfully manage invasions on its own, especially given the parlous state of the government finances at present.

This means that the direct responsibility for addressing part or all of these investment objectives does not fall solely within DEA&DP's mandate. Therefore, the DEA&DP staff charged with implementing the EIIF need to do so in co-operation and partnership with other government entities because multi-department engagement with the implementation of the EIIF is required to achieve the desired outcomes. The co-created and participatory nature of the EIIF has ensured that the priorities and interests of the role players mentioned have been incorporated. The IMP must reflect these roles and responsibilities in the way it frames the approach to the indicators and how the indicators themselves have been defined.

Three necessities should guide implementation and monitoring of individual investments:

(i) All investments in which the EIIF plays a role must report on their progress against the goals of that investment. For investments in:

   a. Objective 1: reporting on the indicators in Table 2 section 1 should be a requirement in the project plan (as appropriate to that project)

   b. Objective 2: reporting on the indicators in Table 2 section 2 should be a requirement in the project plan (as appropriate to that project)

   c. Objective 3: reporting on the indicators in Table 2 section 3 should be a requirement in the project plan (as appropriate to that project)

   d. Objective 4: Reporting on the indicators in Table 2 section 4 should be a requirement in the project plan (as appropriate to that project)

(ii) An online system needs to be developed by DEA&DP where they can capture and collate project-level information, or where such information can be entered directly by the project implementers.

(iii) Ideally, all investments in EI in the Western Cape should be collated in a central database to enable the tracking all EI related investment in the WC and assessment of the role of the EIIF in this larger picture.

The boxes in the subsections below describe key threats to EI identified in the EIIF. Each of the threats is described in detail in the EIIF, so the reader is advised to familiarise themselves with that document. As far as possible, the wording of the threats has been kept the same as it appears in the EIIF. However, there are instances where slight modifications have been made, without changing the essence, in order to provide more clarity and to enable the reader to use this document without complete reliance on the EIIF.

3.2.1 Improved water quality and quantity through the control of invasive alien plants (IAPs) and improving the ecological condition of rivers, wetlands and estuaries

THREATS

- Reduced water runoff due to the spread of IAPs;
- Degradation of river and wetland systems due to modification activities (e.g. through the channelization of rivers to increase agricultural land, new developments) as indicated by the present ecological status of rivers and wetlands;
- Degradation of estuary function due to reduction in water quality and quantity, and changes in the timing of flows, as indicated by the ecological status of the estuaries.

The key to effective water resource management is understanding that the water cycle and land management are inextricably linked (Bossio et al., 2010). Investment aimed at improving water quality and quantity needs to address the threats listed above. At the end of the investment period, the investor must be able to answer these kinds of questions: "To what extent have water quality and quantity improved?" and "To what extent has the ecological condition of water-provisioning ecosystems improved?" These kinds of questions form the basis for the four headline indicators listed for the first investment objective (see Table 2).

Proposed activities must tackle the drivers of poor water quality and quantity, in order to contribute to the realisation of the headline indicator. To this end, activities that deal with invasion by alien plants, and the associated reduction in runoff, as well as the pollution of water bodies and the concomitant erosion of associated ecosystem services, were identified. This exercise resulted in a list of 10 activities, spread across four headline indicators. Because IAPs have been identified as one of the major threats to water security in the Western Cape, the control of same is listed here as the first headline indicator. To achieve this, four activities are suggested, viz: (i) regular mapping of IAPs in priority catchments; (ii) alignment of investment into clearing with the priority catchments identified in the EIIF; (iii) meaningful monitoring of progress and; (iv) monitoring of effectiveness. The stakeholders identified as potential owners of this headline indicator are institutions and programmes that are already involved in IAP clearing work, such as DEFF-NRM, LandCare, etc.

The second headline indicator is concerned with increased water in the catchments, which will require regular stream-flow measurements in representative catchments. The full realization of this headline indicator hinges on the successful development and deployment of a stream monitoring programme. However, such programmes are expensive and technically challenging, so the IMP will rely on reporting on the streamflow monitoring programme already being undertaken by the Greater Cape Town Water Fund in the Western Cape Water Supply System catchments. There is another indicator of increased water flows though, which is based on the fact that there are simple models for estimating the impacts of

invasions on mean annual runoff (MAR). These models use data on the characteristics of the invasions and information on the MAR. The Management Unit Control Plan (MUCP) software includes such a calculator. So, if the software was used for planning IAP clearing programmes funded by the EIIF, estimates of MAR reductions would be automatically generated. When the IAP data are updated to reflect the changes in the state of the IAP invasions, the software would also calculate the updated MAR reductions, indicating the gains being made through clearing. The streamflow monitoring programme will report on two indicators: changes in MAR and duration of flow. Still, climate change and drought can have a confounding impact on streamflow indicators, making it hard to establish a definite, quantifiable cause-and-effect relationship between IAP clearing and resulting higher water quantities. This caveat must be borne in mind when evaluating the impacts of investment. Coupling MAR and flow monitoring to climatic variables (e.g. rainfall/ temperature) monitoring in the catchment could assist in identifying climate related impact.

Improved water quality is the third headline indicator under the water security investment objective. The activities linked to this are, (i) regular monitoring of water quality at selected sites, using measures of pollutants, turbidity and SASS5 score; (ii) active restoration of sites affected by severe fires in invaded areas; and (iii) active restoration of areas cleared of IAPs. The main aim of the two latter activities is to reduce sediment loss. Similar to the second headline indicator, this water quality headline indicator can only be realised if a proper monitoring programme is established.

The last headline indicator is in recognition of the fact that improved water quantity and quality are not an end in and of themselves. Rather, through their attainment, certain ecosystem services will accrue to society. For example, there may be a surge in recreational activities, or an improvement in people's opinions of the state of the province's freshwater bodies. Capturing these values using tools such as surveys, can give a good indication of the societal impacts of the investment.

3.2.2 Reduced vulnerability to the threat of uncontrolled wildfires

THREATS

- Increased exposure to uncontrolled wildfires due to a lack of fuel reduction measures (e.g. fire exclusion from fynbos; unmanaged alien plant invasions), indicated by the estimated fuel loads in the wildland-urban interface/intermix and in natural vegetation in rural areas;
- Increased exposure to uncontrolled wildfires due to unwise and/or uncontrolled urbanisation (incl. both formal and informal development) as well as human activities such as lighting fires.

The Disaster Management and Fire and Rescue Services Chief Directorate of the WCG has adopted a proactive approach to veld fire risk management, as detailed in the Western Cape Veld Fire Plan 2019-20 (WCG, 2019). The plan emphasizes that fire prevention is a crucial component of veld fire management, in addition to fire suppression. The activities and indicators included in this IMP relate to prevention, which is a proactive approach to fire management. Two headline indicators have been developed, related to (i) the prevention of, or reduction in incidences of, unplanned anthropogenic ignitions; and (ii) the reduction of the severity and extent, in the case of unplanned fires.

Associated with the first headline indicator are three activities, *viz;* awareness creation in communities that are vulnerable[1] to fire risk; prohibition of activities that are potential sources of ignition; and the enforcement of related laws. FPAs and municipalities are identified as key role players in realising the associated target of increased awareness and concomitant reduction in unplanned anthropogenic

[1] Vulnerability to fire risk has two components: (i) exposure e.g. through being in an area with high fuel loads. (ii) the ability to cope or recover from the impacts of a fire (e.g. having insurance to replace destroyed property).

wildfires. In the case of non-compliance with relevant legislation, law enforcement agencies will have to play a role.

The second headline indicator is mainly concerned with minimizing the potential for, and impact of unplanned fires, mainly through the management of fuel loads. It is a statutory requirement under the National Veld and Forest Fires Act (No. 101 of 1998) that landowners take particular measures for fire protection. Thus, the first activity identified is the creation of awareness among landowners around this obligation. Fire Services Work Groups and FPAs would be the most likely champions for this together with the District Municipalities which are playing leading roles in the FPAs. Activities specifically related to fuel load management include the creation and maintenance of firebreaks; carrying out prescribed burns when appropriate; and clearing IAPs. The responsibility for these activities would largely fall on land owners/managers, and on municipalities to some extent. For example, managing fuel loads in the home ignition zone would be the responsibility of land owners. However, the wildland-urban interface would be the shared responsibility of land owners and the municipality. The wildland, at the other end of the spectrum, would be the responsibility of the district municipality. The issuing of directives was also listed as an activity that could contribute towards the reduction of the severity and extent of unplanned fires. This would come into play in instances of non-compliance with the provisions of the specified law.

Overall, the impact of fire on the indicators and targets of the other investment objectives must be kept in mind during implementation and monitoring. These impacts must be noted and anticipated where possible through baseline monitoring and modelling.

3.2.3 Improved land management to sustainably support livelihoods and food supply from rangelands

THREATS

- Degradation of rangeland productivity due to poor land use practices (particularly over-grazing and unmanaged IAP invasions) resulting in a loss of rangeland productivity and increased soil loss.

The rangelands of the Western Cape face two re-enforcing threats: climate change and degradation due to poor land-use practices, including alien plant invasions. Although rangelands are spread throughout the province, the Karoo has been the most studied. However, there is no consensus as to the condition of Karoo rangelands. Indeed, a general paucity of current information on veld condition for the rest of the province is named in the EIIF as one of the potential constraints to investment. Without this information it is hard to quantify the problem and set realistic goals for investment. Consequently, the first activity recommended is the regular assessment of veld condition, followed by the implementation of active restoration of degraded areas. These two activities together will contribute to the achievement of the headline indicator of "improved veld condition". For large-scale condition assessment, the lead agencies would be DoA, CapeNature, SAEON, SANBI (Biodiversity and Land Use Project) and DEFF-NRM in instances where they are doing post-rehabilitation monitoring. At farm scale, landowners would have to take the responsibility of doing these assessments and disseminating the information to a central repository. It is important to collate such local scale information in order to produce land cover data for wider areas. Additionally, remote sensing, which has proven useful in assessing rangeland condition in semi-dry areas (Lück-Vogel et al., 2013), could be used to plug the existing information gap. Furthermore, restoration could become a requirement for environmental authorisation, as well as part of the Sandveld Standard when approved (WCG, 2018). Compliance with these requirements would have to be reported by DEA&DP (Development Management).

The second headline indicator involves being proactive in preventing further degradation, by adopting sustainable agricultural practices. To realise this ideal, DoA will need to play a key role in supporting

livestock farmers. As a matter of fact, sustainable agriculture is a key focus of the collaborative project of DEA&DP and DoA known as Smart Agriculture for Climate Resilience (SmartAgri). Ultimately, however, it is the farmers themselves who need to take ownership of the need to farm sustainably. Incentives for this approach include accreditation with market-facing schemes such as eco-labelling initiatives; the Sandveld Standard and the Agroecology professional body, both of which are currently being established.

The three activities recommended to deal with the threat of rangeland degradation in the Western Cape are in close alignment with three of the four actions required to achieve land degradation neutrality globally; *viz;* sustainable land management; ecosystem restoration; mobilizing finance and providing other incentives; and monitoring status and trends (IPBES, 2018).

3.2.4 Reduced exposure to flooding

THREATS

- Increased flood damage potential due to poor town planning, especially in informal settlements, in areas where there is high potential for flooding due to intense rainfall events and responsive catchment areas;
- Increased coastal vulnerability due to coastal erosion and flooding from the ocean that is anticipated to occur with ongoing climate change and ongoing urban expansion in the coastal zone;
- Increased flood damage potential due to the degradation of natural vegetation and hardening of surfaces, which increases the potential for high volumes and increased velocity of runoff with short lag times in response to rainfall.

The flood risk component of the EIIF has a strong focus on development and the need to reduce the exposure of infrastructure and human settlements to inland and coastal flooding. Consequently, the first headline indicator identified is concerned with minimizing both the incidence and resulting impact of flooding events. Linked to this headline indicator are three activities, relating to (i) mapping of risk prone areas, such as that which has been done for the Berg and Breede Rivers as well as the Western Cape coastal region (see https://mapservice.environment.gov.za/Coastal%20Viewer/); (ii) limiting development in such areas, by adopting demarcated coastal management lines and development setback lines; and (iii) mitigating the potential of future developments to contribute to increased flooding. The last point relates to acknowledging the need for balancing green and grey drainage systems in development plans. Local municipalities are expected to be primary implementers of these activities, with support from the disaster management branch of the Department of Local Government (DLG) for the mapping activity, and the Western Cape Department of Human Settlements (DoHS) when it comes to the planning of new developments.

The second headline indicator named is concerned with the protection or restoration of ecological infrastructure that plays a role in flood mitigation, such as wetlands, riparian vegetation, dune systems and estuaries. Indeed, the rehabilitation of these ecosystems is recognised as a necessary activity to reduce coastal vulnerability in the Western Cape Coastal Management Programme (DEA&DP, 2016c). Institutions that typically implement restoration programmes (e.g. DEFF-NRM, CapeNature and SANParks) are suggested as potential co-owners of this indicator.

Lastly, the EIIF names the degradation of natural vegetation, as a result of overgrazing and IAPs, as one of the risk factors for flooding. To address this threat, active restoration of natural vegetation was identified as the third headline indicator. Where such restoration is necessary, this should be undertaken as a partnership between the municipality whose assets are at risk, LandCare (Western Cape Department of Agriculture), Disaster Management and the landowner(s) involved. However, in terms of

the Conservation of Agricultural Resources Act, and its regulations, the responsibility for the land degradation remains with the land owner.

4. CONCLUSION

In order to achieve the desired outcomes for resilient EI in the Western Cape, cooperation among different stakeholders mandated with guardianship over EI is critical. For the components of EI the EIIF is concerned with, several government departments and entities have been identified as key stakeholders, with whom DEA&DP will have to partner. This emphasizes the coordinating role of DEA&DP, at a strategic level. To this end, this IMP distinguishes between two levels of implementation and monitoring, *viz:* strategic and project level. At the strategic level six overarching themes were identified and linked to desired outcomes, as well as actions required to achieve those outcomes and proposed means of measurement.

For project level implementation and monitoring, a total of 11 headline indicators and 27 activities were identified across the four investment objectives. In turn, these activities are associated with a suite of performance indicators, which are largely quantitative inputs, activities and outputs (with reference to the categories presented in Figure 1). To a large extent, the targets, on the other hand, represent outcomes.

Keeping in mind that the ultimate aim of this IMP is to enable investors to determine whether their contributions are having the required impact in terms of restoring EI, and thereby increasing the resilience of EI in the Western Cape, an overarching indicator would be one that looks at the money invested and the benefits[2] derived, as represented by the targets. In the long term, this will enable the measuring of the link between resources invested and their efficiency, and efficacy to give an indication of impact.

The buy-in of the different stakeholders identified under the "responsibility" column will be crucial for the realization of the imperatives of the EIIF. Lastly, there must be cognisance of the assumptions associated with each activity, for implementation to be undertaken.

[2] The benefits could include the avoidance of dis-benefits or adverse outcomes. For example, fire is essential for maintain fynbos ecosystems but simultaneously can have negative impacts and outcomes as seen with the 2017 Knysna fires. Integrated Fire Management, as advocated in EIIF, can find a balance between the benefits and dis-benefits.

Table 2: Implementation and monitoring plan for assessing progress on the implementation of actions aimed at achieving the four priority EI investment objectives. Reporting on this level should a be a requirement for all investments that are guided and made through the EIIF but, ideally, they should be adopted for all investments in EI in the Western Cape so that there is a clear understanding of who is investing in what and where, and how effective those investments are.

H/L indicator number	Headline indicator	Activity	Responsible entities DEA&DP needs to engage with to achieve the objectives	Indicator	Target	Assumptions and notes
Investment objective 1: Improved water quality and quantity through the control of invasive alien plants (IAPs) & restoration of key water source areas.						
1.1	Spread of IAPs brought under control	Area-wide mapping of IAPs in priority catchments	• DEFF-NRM operational support and planning • CapeNature • DoA (LandCare) • Local Government • DEA&DP planning	• Area (ha) infested by IAPs	• Reduction or no increase in extent of IAPs compared to baseline	• CapeNature will continue annual IAP mapping of their protected areas • National IAP Survey will be successful, will be repeated at five-year intervals and includes the Karoo biome.
		Align IAP clearing investment with EIIF priorities	• DEFF-NRM operational support and planning • DoA (LandCare) • CapeNature • Other implementing agents and clearing initiatives	• % of budgets allocated in EIIF priority areas	• 100% of budgets spent in EIIF priority areas	• Projects located in priority areas, as identified by landowner agreements; alignment may take time • All IAP clearing project plans are aligned with EIIF priorities • Budgeting information can be easily collated
		Monitor progress of treatments to ensure they are on track	• DEFF-NRM operational support and planning, and regional management • DoA (LandCare) • CapeNature • Other clearing project managers	• Areas treated as a proportion of planned areas • Budget spent in a specific period as a proportion of planned budget	• Planned areas 100% complete • Planned budgets 100% spent	• Access to information on progress at project level for a representative sample of treatments

H/L indicator number	Headline indicator	Activity	Responsible entities DEA&DP needs to engage with to achieve the objectives	Indicator	Target	Assumptions and notes
		Monitor effectiveness of treatments	• DEFF-NRM operational support and planning, and regional management • DoA (LandCare) • CapeNature • Other clearing project managers	• Areas treated as per contract (i.e. cleared the correct area) • Areas cleared according to norms and standards • Post-treatment state of IAPs meets standards	• 100% of areas treated as per contract • 100% of treatments meets standards	• Access to information on treatment effectiveness is available at project level for a representative sample
1.2	Increased water in catchments	Regular stream flow measurements in representative catchments	• DHSWS • Greater Cape Town Water Fund and other Water Funds	• Change in mean annual run-off (MAR) • Change in duration of flow in rivers • Lag time between rainfall and discharge	• Increase in MAR over time as clearing progresses • Increased duration of flow in rivers • Decreased lag time	• DHSWS monitoring continues in the long term and is effective • GCTWF maintain their stream flow monitoring programme in the WCWSS • TNC is successful in establishing further Water Funds and streamflow monitoring programmes in representative catchments • Decreases in runoff are projected for the winter rainfall region and could substantially undermine water security gains from clearing; little can be done about this but to prioritise investments in other water conservation measures.
	Impact of reduced extent of invasions on mean annual runoff reductions (MAR)	Estimate the increases in MAR due to clearing using the MUCP software and invasion data from the mapping and the treatments	Agencies implementing invasive alien plant clearing programmes funded through the EIIF	Estimated decrease in the flow reductions (i.e. increase in MAR) based on data on the initial state of the invasions and the post-treatment state of the invasions	• Net decrease in mean annual runoff reductions for all invasive alien plant clearing programmes	• The use of the MUCP software or a similar calculator of reductions in MAR • The availability of suitable data on the initial and post-treatment states of the invasions.

H/L indicator number	Headline indicator	Activity	Responsible entities DEA&DP needs to engage with to achieve the objectives	Indicator	Target	Assumptions and notes
1.3	Improved water quality	Regular monitoring of water quality at selected sites	• DHSWS • Cape Nature • CMAs	• Levels of pollutants • Levels of turbidity • SASS5 score	• Reduced pollution levels compared to baseline • Increased SASS5 score from baseline	• The feasibility of expanding the water quality monitoring programme (incl. groundwater) is investigated • Monitoring will be frequent enough to exclude outlier samples. • Increased runoff or recharge dilutes pollution • Clearing of acacia species in areas with groundwater use is monitored to avoid nitrate pollution impacts
		Active restoration of sites affected by severe fires in invaded areas	• DEFF-NRM • DEA&DP • DLG (Disaster Management)	• Sediment loss (suspended sediment)	Sediment loss minimised through active restoration Reduced mean suspended sediment compared to baseline	• A post-fire active restoration and sediment loss monitoring programme is developed
		Active restoration of areas cleared of IAPs	• DEFF-NRM • DEA&DP • CapeNature	• Functionality of EI measured by loss of sediment	Acceptable (i.e. near natural) loss of soil through erosion	• Active restoration is not currently the norm for most IAP clearing projects but, ideally, over time it should become the norm • Evidence is gathered to motivate for the cost-effectiveness of active restoration

H/L indicator number	Headline indicator	Activity	Responsible entities DEA&DP needs to engage with to achieve the objectives	Indicator	Target	Assumptions and notes
1.4	Improved ecosystem services	Conduct surveys of recreational activities, public perception, psychological and amenity values	• DEA&DP • CapeNature • SANParks • DWS • Department of Economic Development and Tourism • Municipal Tourism Agencies • Academic institutions	Quantified benefits from active and passive use of inland water bodies	Improved perception of benefits relative to the baseline	• Suitable survey is designed and conducted regularly
1.5		Estimating the monetary value of increased water flow	• DEA&DP • TNC	Economic value	Increased economic benefits	• Suitable methods for estimating these benefits were developed for the GCTWF and can be deployed in representative sites
Investment objective 2: Reduced vulnerability to the threat of uncontrolled wildfires						
2.1	Fewer unplanned anthropogenic ignition incidents	Create awareness (e.g. through fire alerts, press releases, creation of FireWise communities)	• FPAs • WC Disaster Management • District municipalities • Department of Agriculture • CapeNature • Community collectives such as the Greater Simonsberg Conservancy and Groenland Conservancy • Biosphere reserves	• Number of awareness campaigns held • Awareness levels among vulnerable communities	• Vulnerable communities are well-informed	• Appropriate tool/s to measure awareness levels (e.g. surveys) are available or can be developed. • Reports on these activities are already provided by FPAs. and should be by District Municipalities and by DEFF • The Firewise community programme is maintained and expanded

H/L indicator number	Headline indicator	Activity	Responsible entities DEA&DP needs to engage with to achieve the objectives	Indicator	Target	Assumptions and notes
		Prohibit activities that are potential sources of ignition in dangerous weather	• WCDM • Local municipalities • District municipalities • FPAs (e.g. Groenberg and Simonsberg Conservancies) • SANParks • CapeNature	• Number of unplanned anthropogenic fires	• Reduced number of unplanned anthropogenic fires (there will be incremental reduction of unplanned fires)	• There are effective and accessible channels of communicating fire risk (e.g. AFIS) • WCDM and FPAs document the origin of fires to determine whether they were natural or anthropogenic.
		Enforce related laws	• Law enforcement agencies	• Number of infringement notices issued	• Widespread compliance with related laws	• There is capacity to enforce the law • The organisations undertaking law enforcement actions report their efforts in a standard form and to a central point.
2.2	Reduced severity and extent of wildfires	Create awareness among land owners regarding liability for damages caused by mis-management/ negligence	• Provincial Fire Work Group • District Joint Fire Services Work Groups • FPAs • Community collectives such as the Simonsberg Conservancy and Groenland Conservancy	• extent of FPA membership in fire-prone areas • FireWise communities created	• 100% FPA membership in fire-prone areas • More FireWise communities compared to baseline	It is possible to gather up-to-date FPA membership information.

H/L indicator number	Headline indicator	Activity	Responsible entities DEA&DP needs to engage with to achieve the objectives	Indicator	Target	Assumptions and notes
		Manage fuel loads by creating and maintaining firebreaks	• Public and private land owners • FPAs • District municipalities • CapeNature • SANParks • Community collectives such as the Simonsberg Conservancy, Groenland Conservancy	• km of firebreaks created/maintained • Number of firebreak burns undertaken with approval from the relevant authority • number of fuel management plans integrated • Level of overlap between plans	• Increased km of firebreaks created/maintained compared to baseline • increased number of approved controlled burns from baseline. • Increased pyrodiversity	• The cost of reducing fuel loads may be prohibitive for landowners; this can possibly be addressed by assisting landowners via LandCare co-funding or via NRM clearing projects. • Authorities are subscribed to AFIS or other similar tools • AFIS or a similar tool continues working • Pyrodiversity can accurately be detected from remote sensing data using AFIS.
		Manage fuel loads by conducting prescribed burns when appropriate (with permits from relevant authority)	• Public and private land owners • CapeNature	• Number of approved prescribed burns conducted with approval from the district municipality • Proportion of prescribed burns to unplanned burns	• Appropriate fire regimes are established and maintained • improved fire statistics	• There is requisite expertise, funding and capacity to conduct prescribed burns.
		Manage fuel loads by clearing IAPs	• Public and private land owners • CapeNature	• IAP biomass cleared from fire-prone areas	• IAPs eradicated from fire-prone areas	The Biosecurity Chief Directorate of DEFF has capacity to enforce the invasive species legislation where there is non-compliance.
		Work with DEFF and FPAs to ensure that directives are issued to land owners to reduce fuel loads	• Forestry Branch within DEFF & FPAs (District Municipality Disaster Management)	• Number of directives issued and complied with as reported by the authorities	- Directives issued and 100% compliance with directives	The Forestry Branch of DEFF has capacity to enforce the Veld & Forest Fires legislation where there is non-compliance.

H/L indicator number	Headline indicator	Activity	Responsible entities DEA&DP needs to engage with to achieve the objectives	Indicator	Target	Assumptions and notes
Investment objective 3: Improved rangeland management practices						
3.1	Improved veld condition	Conduct veld condition assessments	• DoA, • landowners/farmers • CapeNature • DEFF-NRM (post clearing monitoring) • SAEON	• Basal cover and stage of succession • Plant species diversity (or proportion of palatable to unpalatable species) • Veld condition score or ecological index	• Higher values for basal cover, species diversity and veld condition, compared to baseline	• Requisite technical expertise and/or capacity exists.
		Implement active restoration where required	• DoA (LandCare) • DEA&DP (Pollution & Chemicals Management) • DEFF-NRM	• ha restored • long-term grazing capacity	• Reduced levels of degradation compared to baseline	• Restoration costs are not prohibitive or can be offset against ecosystem service benefits.
3.2	Widespread implementation of sustainable agricultural practices	Enhance and extend support to livestock farmers	• DoA (LandCare) • DEA&DP	• Number of farmers implementing sustainable agricultural practices • Number of farmers registered with the Sandveld Standard or similar • Number of farmers accredited in terms of ecolabels such as ethical biotrade, and the proposed SANBI label	• All farmers follow sustainable agricultural practices in the long term. • Increasing number of farmers adopting agroecological principles	• Access to information on agricultural practices at farm level • Capacity and expertise to provide extension services • Measures can be put in place to ensure that farmers are not counted more than once in terms of the indicators put forward.

H/L indicator number	Headline indicator	Activity	Responsible entities DEA&DP needs to engage with to achieve the objectives	Indicator	Target	Assumptions and notes
Investment objective 4: Reduced exposure to the impacts of flooding						
4.1	Reduced incidence and severity of flooding events	Conduct area-wide, fine-scale flood risk mapping beginning with the priority catchments identified in the EIIF	• DLG (disaster management) • Local municipalities	• Number of municipalities with up-to-date flood risk maps	• All municipalities have flood-risk maps • See the Green Book maps of Flood Risk at Municipal level (https://riskprofiles.greenbook.co.za/	
		Compulsory use of existing flood risk maps and coastal management lines (CMLs) for development processes, and enforce compliance thereto	• DoHS • Local municipalities	• Number of municipal SDFs with flood risk provisions • Number of municipalities reflecting the CMLs in their SDFs • Number of municipalities reflecting CMLs in their zoning schemes • Number of prioritised estuaries for which flood line assessments have been concluded	• Restricted development in risk prone areas according to building type/purpose	• Coastal flood, erosion and coastal management lines have been developed and will be gazetted by the Province • CSIR & partners are currently developing complementary flood and erosion lines on national level as well. • Inland flood risk mapping has been done for the Berg and Breede rivers.
		Incorporate flood risk assessment and mitigation in development planning	• DoHS • DEA&DP (Development Management, & Spatial Planning) • Local municipalities	• Number of municipal SDFs with flood risk provisions	• All municipal SDFs provide for Sustainable Urban Drainage Systems	

H/L indicator number	Headline indicator	Activity	Responsible entities DEA&DP needs to engage with to achieve the objectives	Indicator	Target	Assumptions and notes
4.2	Protected or restored flood attenuation ecological infrastructure (e.g. wetlands and dunes)	Actively restore degraded areas important for flood mitigation	• DEFF-NRM • CapeNature • SANParks • Municipalities for non-protected areas	• Extent (ha) of natural vegetation, including wetlands, restored in flood-prone areas[3]	• Improved ecosystem functioning and flood protection service delivery compared to baseline	• This will require fine-scale mapping of degraded areas (has been done for RMMPs).
4.3	Restoration of land degraded through overgrazing or other management practices	Actively restore areas of degraded natural vegetation to reduce surface runoff	• Public and private landowners in partnership with the municipality, Agriculture and Local Government (Disaster Management)	• Extent (ha) of natural vegetation restored	• Increased vegetation cover in previously denuded areas • Reduced surface runoff due to increased infiltration	• The cost of active restoration may be prohibitive on the individual landowner so the partnership would be about supporting the landowners in undertaking the necessary restoration.

[3] The Green Book (https://greenbook.co.za/) dataset used in the EIIF included an analysis of the portions of settlements that could be exposed to floods (within 10 m elevation of the river channel).

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Appendix 1: List of investment objectives and associated key strategic actions (source: EIIF).

KSA number	Key strategic action
Investment objective 1: Improved water quality and quantity	
1.1	Ensure the strategic protection and rehabilitation of aquatic ecosystems
1.2	Improve the effectiveness of water resource allocation and management to ensure the sustainability of water resources
1.3	Enable the coordinated rehabilitation of ecological infrastructure within catchments to ensure the sustainable delivery of high-quality water in support of socio-economic development and ecological integrity
1.4	Explore financial and other incentives for rehabilitation by landowners
1.5	Control the spread of alien invasive plants
1.6	Promote and enable conservation agricultural systems
1.7	Increase understanding and awareness among all stakeholders within the Province around ecological infrastructure
1.8	Enhance the knowledge and capacity of land use planners, engineers and other technical experts to integrate the protection and rehabilitation of WSAs into land use planning at various scales
1.9	Develop expertise and capacity in wetland, river and estuary rehabilitation options
1.10	Increase resources and capacity available to organisations responsible for rehabilitation
Investment objective 2: Reduced vulnerability to the threat of uncontrolled wildfires	
2.1	Maintain an appropriate fire regime to sustain ecological infrastructure by incorporating the principles of Integrated Fire Management into all veld fire-related policies and plans
2.2	Enable the organisational development needed to improve awareness of fire risks and to prepare landowners and other stakeholders for fire risk reduction
2.3	Support FPAs in the drafting of fire risk assessments and plans and incorporate these into development planning at a provincial and local scale
2.4	Enable Disaster Management Agencies within all spheres of government to integrate fire concerns into their disaster management planning.

KSA number	Key strategic action
2.5	Ensure the harmonisation of all relevant plans (i.e. all those addressing fire risk) across administration boundaries
2.6	Improve and expand public awareness programmes of the inevitable risk (i.e. social, ecological and economic risks) of fire and enable people to learn to 'live with fire' by managing, mitigating and adapting to the risks
2.7	Enable and support municipalities to prepare – and pass - appropriate and practical by-laws for reducing fire risk
2.8	Explore incentives for the private sector to promote the implementation of fire prevention and risk mitigation measures
2.9	Enable and promote the implementation of fuel load reduction strategies at the landscape level
2.10	Promote and enable opportunities for livelihood creation
2.11	Facilitate a strategic initiative related to forestry exist areas
2.12	Ensure the early detection and monitoring of fires
2.13	Expand the use of digital technology
Investment objective 3: Improved land management practices	
3.1	Increase inter-disciplinary understanding of the impacts of changes in climate and land-use on livestock production
3.2	Investigate the implementation of sustainable grazing systems
3.3	Ensure the availability of viable seeds
3.4	Maintain, enhance and extend the support provided to livestock farmers for the implementation of sustainable agricultural practices,
3.5	Increase compliance with relevant legislation
3.6	Increase incentives for sustainable livestock management
3.7	Establish and promote long-term and co-ordinated monitoring of veld condition to enable restoration
Investment objective 4: Reduced exposure to the impacts of flooding	
4.1	Develop a fine-scale understanding of flooding risks (inland and coastal), dynamics and impacts at a local level

KSA number	Key strategic action
4.2	Enable the effective use of existing data, geospatial technologies and future research (such as that suggested above) by municipalities and Provincial authorities, so that they can easily identify local areas at risk of coastal and inland flooding (now and in the future) and can proactively implement appropriate mitigation measures, in consultation with affected stakeholders
4.3	Ensure that decision-making regarding urban and agricultural development and infrastructure is informed by the risks of flooding (inland and coastal) and its impacts.
4.4	Ensure that disaster planning takes cognizance of the risks of inland and coastal flooding, through integrating information regarding these risks into the Disaster Management Plans at all scales, in terms of the Disaster Management Act (No. 57 of 2002).
4.5	Ensure the protection and restoration of ecological infrastructure (e.g. Riparian zones, inland wetlands and coastal dunes) that performs a flood attenuation function.
4.6	Explore incentives for the private sector to promote flood safety.
4.7	Expand awareness among stakeholders, including communities, government and NGOs, of the potential risks of flooding and the measures that can be taken by all to minimize its impacts.
4.8	Build capacity among coastal managers and other relevant officials
4.9	Integrate an understanding of the role of ecological infrastructure (e.g. wetlands) in flood prevention and mitigation into relevant academic curricula (e.g. for engineers, town and regional planners and environmental managers).
4.10	Investigate opportunities to streamline existing legislation and management plans, relating to coastal risks (e.g. flooding and erosion) and their prevention, across the various spheres of government (i.e. local, provincial and national).

Chief Directorate: Environmental Sustainability
Directorate: Biodiversity and Coastal Management
Western Cape Government Department of Environmental Affairs and Development Planning
Private Bag X 9086
Cape Town, 8000
Tel: (021) 483 5126 **Fax:** (021) 483 3016
Email: Marlene.Laros@westerncape.gov.za

www.westerncape.gov.za/eadp

Western Cape Government
Environmental Affairs and Development Planning