A Review of Target Case Studies to Inform a Framework for Supporting Investment in Ecological Infrastructure

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EXECUTIVE SUMMARY

It is widely acknowledged that optimally functioning ecological infrastructure (EI) provides a diverse range of ecosystem services which are vital for human wellbeing, optimum environmental functioning and economic support. These ecosystem services provide direct and indirect benefits which include, inter alia, water regulation, climate regulation, water purification, biodiversity conservation and soil formation (Rasmussen et al., 2021; Sokolova et al., 2024). It is expected that with the increase in climate change impacts and a rapidly growing population, water-related EI will become increasingly important, especially for providing potable water. Additionally, the rehabilitation, restoration and maintenance of EI can enhance the resilience of these ecosystems within catchments, strengthening their ability to withstand and recover from extreme weather events. Despite the growing awareness of the critical importance of EI, water-related ecological systems continue to deteriorate mainly due to, inter alia, anthropogenically driven activities such as urbanization, deforestation, poor agricultural practices, mining, and pollution. Along with addressing the drivers of further degradation, increasing investment in the restoration, rehabilitation and management of EI is critical. The primary goal of investing in EI is to restore or sustain the natural functioning of ecosystems (Jewitt et al., 2020). By doing so, these ecosystems can continue to deliver important ecosystem services for the environment and people.

To drive investment in EI, quantifiable user-appropriate information demonstrating the tangible and intangible benefits of EI is needed. The benefits need to be appropriately packaged and articulated drawing from the outcomes and learnings from existing EI initiatives. Showcasing the benefits of EI will help to motivate the integration of EI into the water value chain. However, securing the necessary support for EI investment is currently hindered by several challenges, including inter alia:

i) Insufficient user-appropriate evidence-based information of appropriate EI rehabilitation and management, demonstrating its role in supporting sustainable development and the benefit to water users and the broader public and private interest benefits.
ii) Insufficient demonstration, appropriately packaged, information of the value proposition of water-related ecological infrastructure specifically to development finance institutions (DFIs) and the private sector.
iii) Limited awareness of DFIs and the private finance sector regarding the potential for inclusion of EI in bankable projects to reduce risks and to seek opportunities for increased impact and sustainability of investments and the information/evidence and mechanisms to catalyse public private collaboration in EI rehabilitation and protection.
iv) Few positive impact demonstration projects to raise benchmarks and provide financial models/mechanisms and show cases/flagships for aggregating and accelerating transformative change in the infrastructure sector (particularly those investments with high nature impacts and dependencies).

This project aimed to address these gaps by developing a user-appropriate EI framework to promote investment in managing and rehabilitating EI. To inform the framework development process, the study undertook several data collection activities, including a stakeholder engagement, an in depth-literature review process and comprehensive case study evaluation of four (4) South African initiatives. The case study approach formed the foundation of this study, with the literature review, stakeholder engagement and framework development process informed by the case studies. Below is a brief description of the data collection activities undertaken:

- **Literature review**: A review of grey and published literature was undertaken of varied cases of EI interventions and investment. This review was aimed at addressing the guiding questions developed from the study objectives (presented below). The literature review provided key insight on the financial mechanisms, funding structures and parameters that influence and enable investment in EI (**Appendix 1**).
- **Stakeholder engagement**: A comprehensive stakeholder engagement process informed by the case studies was conducted with stakeholders from varied sectors. This process included preliminary engagement with stakeholders identified by the Water Research Commission (WRC) working group, from which a stakeholder database was developed. The research team also leveraged off existing networks to identify additional stakeholders as the project progressed. The insights and perspectives shared by the stakeholders provided valuable real-life information of the procedures and associated outcomes of investing in EI across varied contexts.
- **Case study review**: An in-depth evaluation of four (4) selected EI initiatives was undertaken, with the aim of understanding the motivators, challenges, partnerships and funding arrangements enabling EI investment within the selected initiatives. These EI initiatives were selected for their varied EI management contexts, intervention types, funding sources, land use settings, and the availability of information on the EI initiative. The diversity of the initiatives offered an opportunity for a rich stakeholder engagement process, encompassing diverse forms of EI investment across different catchment contexts. This provided key insights and a foundation from which to inform the development of a user-appropriate framework to promote investment in EI. This report will be focusing on the outcomes of this case study review process.

The case reviews were guided by a suite of guiding questions, including inter alia:

1. What are the quantifiable ecosystem service returns (outputs and outcomes) from EI interventions associated with the implemented initiatives, especially those services related closely to water security?
2. Which role-players were involved in the respective aspects of planning, funding, and implementing EI investments?
3. How relevant are the returns described earlier to key role-players, in particular for private sector role-players?
4. Which funding mechanisms were applied and how did these develop? What criteria, if any, did the initiative need to meet in order to secure the funding?
5. How was the funding structured (organized, designed or set-up) i.e. what type of funding e.g. donations, loans, and repayments etc.?
6. What is the business case for private sector investment in water-related EI within the initiative and how was this developed and communicated amongst the role-players?
7. To what extent has the EI investment contributed to social justice?
8. What key lessons were learnt from the initiatives and, taking these lessons into account, how scalable is the case?

The four (4) selected EI initiatives that were comprehensively reviewed and central to the study included namely 1) the Wolseley Water User Association EI coordinator Initiative, 2) the Mpophomeni-

uMthinzima (Upper uMngeni) Initiative, 3) the uMhlangane initiative and 4) the Klein Swartberg initiative. The four initiatives highlight successful collaborations across different sectors in tackling the challenges of implementing EI interventions, demonstrating the effectiveness of diverse partnerships in achieving sustainable outcomes. Each of these initiatives is briefly introduced below:

- **WWUA EI coordinator initiative:** This small-scale initiative is in the farming town of Wolseley in the Western Cape (South Africa). This farming town faces the challenge of Invasive Alien Plants (IAPs) encroaching in the mountainous farm areas west and east of Wolseley. This poses a serious risk to water security for the town, as these areas are regarded as primary water sources areas for the Breede River (Gelderblom et al., 2021). The water quality challenges faced in the Breede catchment pose a threat to the local businesses reliant on water resources in the catchment to operate. These stakeholders include Woolworths, Marks and Spencer (M&S) and the German Society for International Cooperation (GIZ). This initiative has received funding from varied sources including Coca-Cola, LandCare, the Department of Environmental Affairs and Development Planning, the Western Cape Government, the Breede-Olifants Catchment Management Agency, and the WWUA itself. Although primary funding sources have shifted over time, consistent support has enabled systematic IAP control with timely follow-up clearing. The sustainability and continued success of this initiative can be attributed to the appointment of Ryno Pienaar in 2017, as a local EI coordinator for the WWUA. Within his role, which he still currently occupies, Ryno has been responsible for coordinating and managing the rehabilitation and maintenance of EI within the area. Additionally, the EI coordinator was able to administratively support the management of multiple funding sources within this initiative, which requires a high level of flexibility.
- **The Mpophomeni-uMthinzima Stream (Upper uMngeni) initiative:** Located in Mpophomeni KwaZulu-Natal, this initiative focuses on improving the ecological health of the uMthinzima stream, which runs through the housing settlement of Mpophomeni and drains into a key regional water reservoir, Midmar Dam. Linked to this, is the wetland complex of the uMthinzima stream which serves a key function of enhancing water quality of water sources flowing into Midmar Dam, one of which is the uMthinzima stream. Active wetland rehabilitation, improvement of existing grey infrastructure and raising of environmental awareness through citizen science are interventions that have been implemented to address the water quality challenges of the Mpophomeni-uMthinzima Stream-Midmar Dam system. Several key stakeholders have been involved in these efforts, including the Department of Economic Development, Tourism and Environmental Affairs, uMgungundlovu District Municipality, Umgeni Water, citizen scientists, NGOs (WESSA, DUCT), Working for Wetlands, local catchment management forums, Ezemvelo KZN Wildlife, and research entities. This initiative demonstrates the supportive function of EI in enhancing built infrastructure solutions such as wastewater treatment facilities and reducing the risk of pollution to a key water resource for potable water supply.
- **uMhlangane initiative:** The uMhlangane catchment initiative exemplifies EI investment in an urban landscape. The initiative focusses on rehabilitation and management of an urban freshwater ecosystem to secure critical ecosystems services such as flood attenuation and enhancing water quality. Several initiatives that have been established progressively since the early 2000s, including the Riverhorse Wetland management initiative, Green Corridors Green Spaces project, the Sihlanzimvelo Programme, and more recently eThekwini's Transformative

River Management Programme (TRMP), involving a range of stakeholders including private sector businesses, NGOs, civil society, local authorities, and community groups.

- **The Klein Swartberg initiative:** In the Ladismith town of Western Cape, is a small-scale EI initiative which focuses on enhancing water security of the catchment area, through the clearing of IAPs. Local businesses (most notably, Ladismith Cheese and Lactalis) most affected by water insecurity have supported this initiative through investing in IAP control and removal. The ongoing funding of this initiative has been supported using an application developed by SAEON, which is used yearly to rapidly estimate the amount of water saved associated with the clearing of IAPs. This data is then reported to local businesses involved in funding the interventions and has been pivotal in helping to sustain the funding of this initiative. Stakeholders that have been involved in supporting this initiative include the Mountain Club of South Africa (MCSA), local farmers surrounding areas in Ladismith, the Kannaland Municipality, Cape Nature, and the Gouritz Cluster Biosphere Reserve.

This was followed by a brief review of five (5) EI initiatives in South Africa, namely, the uMhlathuze Water Stewardship Programme, the Nature Conservancy (TNC) Greater Cape Town Water Fund (GCWF), the Program Skoon Veld-Ceres, the Upland River Conservation and the Endangered Wildlife Trust Carbon for Conservation Project. Each of these cases showcase diverse EI investment scenarios, differing in both scale and partnership complexity. This brief case study review provided additional evidence-based information which further supported development of the framework.

- **The uMhlathuze Water Stewardship Programme:** Located in the uMhlathuze catchment, in KwaZulu-Natal, this case demonstrates public and private sector investment in catchment management focusing more broadly on enhancing freshwater coastal lakes and surface water dams, promoting water use efficiency, facilitating agricultural water stewardship, securing EI, and developing community water champions.
- **The Program Skoon Veld – Ceres**: Located in the Western Cape the Program Skoon Veld-Ceres case is primarily a private sector funded initiative supplemented by non-profit funding focused on controlling invasive species to secure water supply and biodiversity. Funding for the initiative was sourced from local businesses, municipal funding and from WWF's Green Trust.
- **The Nature Conservancy (TNC) Greater Cape Town Water Fund (GCWF):** This case focuses on enhancing water security for multiple catchments supplying the Greater Cape Town area. EI interventions include nature-based solutions and IAP management and removal.
- **the Upland River Conservation:** A private sector funded case which focuses on riparian rehabilitation in the upper uMngeni catchment, in an effort to improve water quality, enhance recreational (fishing) opportunities and secure land productivity. Rehabilitation efforts include clearing of IAPs, revegetation and water quality monitoring.
- **the Endangered Wildlife Trust Carbon for Conservation Project:** exemplifies private-private partnerships with rehabilitation efforts aimed at improving grassland and wetland management, to improve water quality and quantity in Strategic Water Source Areas (SWSAs). A sustainable financing mechanism (carbon-offsetting) is used to invest into improved grassland and wetland management.

This report presents the outcomes of the review of these initiatives alongside stakeholder perceptions which provide a rich and real-world experience of EI investment in South Africa. The following

common themes emerged across the four initiatives, and informed the development of the framework:

- **It is important to leverage off existing partnerships** (**which have been built over the years through trust), particularly between investors/funders, which has the potential to increase investment in EI**. For example, a local EI coordinator is able play the role of a 'neutral facilitator' between funders and EI management implementors. Having a 'neutral facilitator' who can effectively and continually engage involved parties (funder, funding recipient and EI implementing manager) consistently can contribute to the sustainability of an EI initiative. Additionally, a local EI coordinator can effectively manage the expectations and social processes linked to multiple funding sources associated with EI initiatives. It is recommended that this EI coordinator or local champion be situated in the community in which the intervention is being implemented, have a proven track record of reliability and be well connected to the relevant role players. This is effectively demonstrated in the WWUA EI coordinator initiative in which a local EI coordinator was appointed through funding from Woolworths to play a supportive role in maintaining and rehabilitating EI. Within his role the EI coordinator, was able to maintain continuity of the initiative despite changes in primary funding sources throughout the duration of the project. Additionally, due to the EI coordinator being hosted in a local institution, this enabled the building of trust with the community and encouraged local ownership of the EI initiative. Furthermore, the EI coordinator was also able to respond to calls for tenders and was able to collaborate with partners to develop and submit funding proposals. It is worth noting that a local EI coordinator is not a magical solution that promises to address all EI related challenges. The following prerequisites need to be put in place to ensure effectiveness of the appointment of the EI coordinator (Gelderblom et al., 2021):
    - The EI coordinator should have the required technical and soft skills to perform day-to-day managerial duties (i.e. budgeting, administration, monitoring and evaluation, reporting and staff management) and the ability to effectively engage a diverse range of role players.
    - The EI coordinator should be housed in a suitable and supportive organisational home that is able to provide the necessary resources required for them to effectively perform their duties.
    - A shared understanding of the role of the EI coordinator is required across the range of stakeholders involved in the EI initiative. This will ensure that the optimal benefits and potential opportunities are accessed and leveraged upon to increase investment in EI.
    - The EI coordinator needs to be well suited for the community he will be appointed in, (i.e. the EI coordinator being well versed in the local language).
    - There should be continuous funding available to support the employment of a local EI coordinator – preferably over a long period of time.
    - It is advisable that an EI coordinator be appointed ideally within an existing EI initiative – to ensure that the funding is made available from the onset and that the outcomes/impact of EI investment are realised within a shorter timeframe.
- **To effectively attract private sector investment** in EI it is important for EI implementing managers to develop a business case showcasing the socio-economic benefits of the EI

intervention. When considering proposals, funders require a strong business case, which should be supported by a strong evidence base effectively demonstrating the socio-economic benefits of the EI intervention. When developing an evidence base both qualitative and quantitative evidence should be considered. The data should demonstrate how the investment in the EI intervention impacts on the EI and the associated ecosystem services it provides. Examples of evidence can be before and after photos of the site, description of the project outcomes or a quantification of the key physical outcomes (i.e. amount of water accumulated due to clearing of IAPs). For short term projects outcomes with slower response time, output level indicators and quantifiable measures are proposed as effective quantifiable measures of impact such as hectares cleared, or jobs created.

- **It is advisable for EI implementing managers/funding recipients to pursue multiple and diverse funding sources.** The desired or required funding to implement an EI initiative may not be readily available, which means that an EI initiative should not rely on one funding source. A commonly faced challenge by EI implementing managers or funding recipients, is the short-term funding period linked to private sector funding. Large-scale EI initiatives require longer term funding for monitoring and evaluation, thus multiple funding sources should be pursued, to ensure that funding lasts or spans over a longer timeframe which would attribute to sustenance of the EI initiative. The Mpophomeni-uMthinzima initiative is exemplary of this as multiple role players contributed to funding different aspects of wetland rehabilitation. Funding sources included the public sector, through the Natural Resource Management (NRM) programme, which providing labour and resources for implementation of soft interventions. uMngeni uThukela Water (UUW) provided funding for hard interventions, and initial funding provided as pro-bono contributions. These multiple funding streams were provided at different timeframes of the project, which ensured the continuation of the project over a longer period.
- **Identify opportunities to link green and grey infrastructure.** There are a range of co-benefits that can be leveraged upon when linking green and grey infrastructure, specifically across private and public sector. These benefits include, inter alia, job creation, social equity, a diverse range of expertise particularly required for highly technical EI projects and increased funding and resources. An example of this is the Mpophomeni-uMthinzima initiative, in which the Midmar Dam (an important regional water supply dam) was highlighted as a key motivating factor for restoring the uMthinzima wetland complex and the EI linked to it. Additionally, the rehabilitation of the downstream portion of the uMthinzima wetland complex, was initiated through motivation by uMngeni-uThukela water because of the required rehabilitation of the upstream wetland being a requirement for of the environmental authorisation of the wastewater treatment works (WWTW).
- **Establishing effective social processes with key role players** (i.e. funders, implementing agencies, community, local authorities). This includes establishing and maintaining a good relationship between all stakeholders. This can be achieved through having transparent, upfront and honest communication of what can be achieved through the project, within the agreed upon timeframe. This includes, being transparent about budget constraints, expected project outcomes and risks that may be posed to the project. Furthermore, maintaining a good funding relationship is particularly important for initiatives that have grown organically, as these relationships have potential to influence the sustainability of the initiative.

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LIST OF ACRONYMS

Acronyms	Explanation
AEN	Amanzi Ethu Nobuntu Programme
AFD	Agence Française de Développement
BLU	Biodiversity and Land Use
BMZ	German Federal Ministry for Economic Cooperation and Development
BOCMA	Breede-Olifants Catchment Management Agency
CAPEX	Capital Expenditure
CBA	Cost-benefit Analysis
CBI	Ceres Business Initiative
CFF	Cities Finance Facility
CFO	Chief Financial Officer
CICLIA	Cities and Climate in Africa
CPPP	Community-Public-Private Partnership
CSR	Corporate Social Responsibility
DARD	KZN Department of Agriculture and Rural Development
DBSA	Development Bank of South Africa
DEADP	Department of Environmental Affairs and Development Planning, Western Cape Government
DFFE	Department of Forestry Fisheries and the Environment
DFIs	Development Financing Institution
DSI	Department of Science and Innovation
DUCT	Duzi uMngeni Conservation Trust
EDTEA	KZN Department of Economic Development, Tourism and Environmental Affairs
EI	Ecological Infrastructure
EI4WS	Ecological Infrastructure for Water Security
EIA	Environmental Impact Assessment
EWT	Endangered Wildlife Trust
FKKP	Programme to Support Municipal Climate Change Mitigation and Adaptation Projects
GCBR	Gouritz Cluster Biosphere Reserve
GCTWF	Greater Cape Town Water Fund
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
JNCC	Joint Nature Conservation Committee
Govt	Government
IA	Invasive Alien
IAPs	Invasive Alien Plants
INK	Inanda, Ntuzuma and Kwamashu
KZN	KwaZulu-Natal
M&S	Marks and Spencer
MCSA	Mountain Club of South Africa
MPN	Most Probable Number
MSEP	Mpophomeni Sanitation and Environment Programme

Acronyms	Explanation
NBI	National Business Initiative
NFEPAs	National Freshwater Ecosystem Priority Areas
NFFC	Natal Fly Fishers Club
NGOs	Non-Governmental Organisations
NPC	Non-Profit Company
NPO	Non-Profit Organisation
NRM	Natural Resource Management
NSSD	National Strategy for Sustainable Development
OCED	Organisation for Economic Cooperation and Development
OpEx	Operational Expenditure
PES	Presidential Employment Stimulus Programme
PPE	Personal Protective Equipment
PPE	Personal Protective Equipment
PPPs	Public-private partnerships
Pvt	Private
RHVBEMA	The Riverhorse Valley Business Estate Management Association
SAEON	South African Environmental Observation Network
SANBI	South African National Biodiversity Institute
SEA	Strategic Environmental Assessment
SECO	Swiss State Secretariat for Economic Affairs
SMMEs	Small, Medium and Micro Enterprises
SWSAs	Strategic Water Source Areas
TKZN	Tourism KwaZulu-Natal
TNC	Transnational Corporation
TRMP	Transformative River Management Programme
UEIP	uMngeni Ecological infrastructure Partnership
UMDM	uMgungundlovu District Municipality
UUW	uMngeni-uThukela Water (previously Umgeni Water)
WESSA	Wildlife and Environment Society of South Africa
WfWet	Working for Wetlands
WRC	Water Research Commission
WULA	Water Use Licence Application
WWF	World Wildlife Fund
WWTW	Wastewater Treatment Works
WWUA	Wolseley Water User Association
WWW	Wastewater Works
YWP	Young Water Professionals

1. INTRODUCTION

With South Africa being characterised as a water scarce country, the urgency to protect and maintain the existing Ecological Infrastructure (EI) has proven to be a high priority. It is anticipated that climate change will likely impact on the quantity and quality of water resources in South Africa, and subsequently affect a large population located in rural communities that rely directly on this natural resource for their livelihoods (crop farming and water for livestock) (Gulati and Scholtz, 2020; Rebelo et al., 2021). Additionally, climate change is expected to affect water availability in cities, as the changes in weather events, which influence rainfall patterns will impact on the availability of water in surface and subsurface water resources that cities rely on. With the global rate of urbanization in cities, the demand for accessible and safe water for use has become a high priority, both globally and locally (Buytaert and De Bievre, 2012; Forero-Ortiz et al., 2020). At a local context, cities such as Johannesburg, eThekwini and Gqeberha, have experienced the detrimental impacts of climate change and its associated extreme weather events such as droughts and floods. This has affected the cities capacity to supply water for a growing urban population and highlighted their lack of readiness in responding to flood events, which are among the water-related challenges posed by climate change. It is apparent that African cities will require innovative approaches to addressing water challenges, which include inter alia, investment in EI within cities, maintenance and management of sewage infrastructure and proper settlement planning; and that will all contribute to climate resilience (Gcanga et al., 2022).

EI provides a range of ecosystem services (provisioning, supporting, cultural and regulating) which are essential for the optimum functioning of humans and the environment (Rasmussen et al., 2021). However, it is reported that our freshwater ecosystems, are highly threatened due to anthropogenic activities such as urbanization, drainage of wetlands for agricultural use and encroachment of alien invasive species. Furthermore, is anticipated that natural habitats such as forests, which act as carbon sinks and contribute to climate mitigation will be lost, due to the growing rate of urbanisation in Africa (Gulati and Scholtz, 2020). With the continued deterioration of EI, there is an increasing need for EI interventions that protect and conserve these ecosystems and the services they provide.

EI interventions can be implemented through various approaches, including inter alia, the restoration of a degraded ecosystem or the creation of a new ecosystems that are able to provide the desired ecosystems services, for example the creation or rehabilitation of a wetland for water quality enhancement. These interventions can contribute to increasing the resilience of these ecosystems to anthropogenic activities and more importantly climate change (Rebelo et al., 2021). According to the Organisation for Economic Cooperation and Development (OCED) (2022), EI investment can be defined as the maintenance of naturally functioning EI, through resource inputs, such as time, funding or decision-making that contribute to protecting or restoring EI. Investment in EI is intended to restore or rehabilitate degraded ecosystems to optimal functionality thereby providing ecosystem services for human and environmental health (Jewitt et al., 2020). Some of these benefits including enhanced water quality, preservation of built infrastructure and flood risk reduction.

The intended aim of the project was to develop a user-appropriate EI framework to promote investment and allow for the mainstreaming of EI. The development of the framework was informed by the insights gained from the detailed review of the four (4) selected EI initiatives. The purpose of this case study report is to provide details of the four selected examples of EI initiatives in South Africa, namely, namely 1) the Wolseley Water User Association EI coordinator Initiative, 2) the Mpophomeni-

uMthinzima (Upper uMngeni) Initiative, 3) the uMhlangane initiative and 4) the Klein Swartberg initiative (**Figure 1-1**), and to present these insights alongside stakeholder perceptions and understandings for each case with the intention of providing real-life information of EI investments in South Africa. In addition, this report highlights, the tangible and intangible benefits of the four selected EI initiatives associated with investing in EI interventions in the water sector. The outcomes of this report provided rich evidence-based information which informed the development of a user-appropriate EI framework - *A framework to support investment in ecological infrastructure: How to bring investors into the funding landscape* (Sithole et al., 2024)

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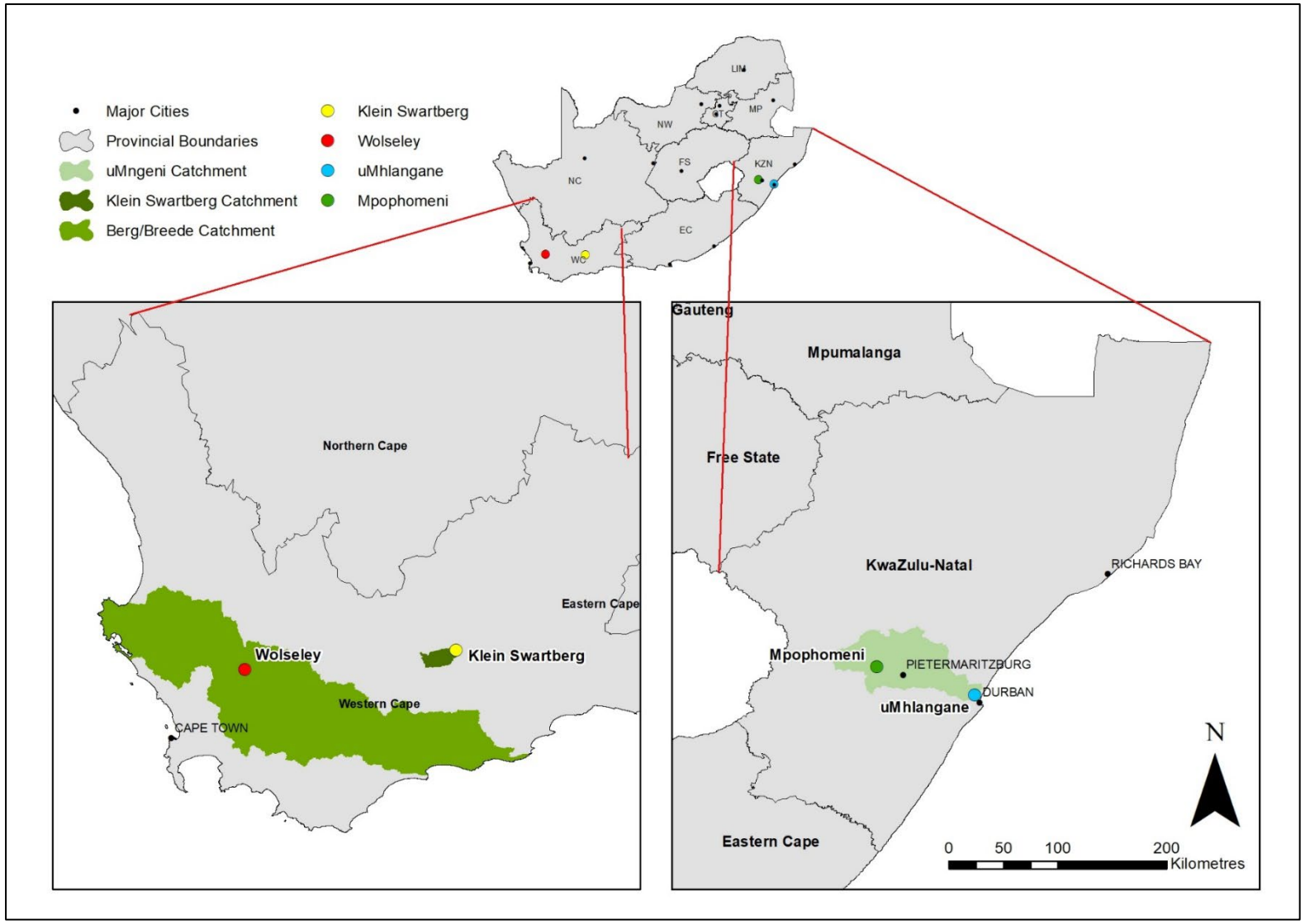

Figure 1-1 Overview of the four selected EI case study sites

2. EI INVESTMENT CASES FROM SOUTH AFRICA

There are a suite of EI investment cases within South Africa ranging in scale and nature. These cases include a diverse mix of EI intervention types, land use management contexts and varied funding arrangements for investment in EI for water security. This section focuses on highlighting some EI investment cases from South Africa, which are documented in **Table 2-1**. It is not intended as an exhaustive review of South African cases, but rather to represent a diversity of South African EI investment cases for which existing information is available. The nine (9) case studies are diverse in terms of the type and scale of the investment/intervention; primary funder(s); partnership arrangements; ecosystem services affected; and the land-tenure and land-use context. For example, the Greater Cape Town Water Fund (GCTWF) is a formalised initiative, which comprises of a comprehensive formalised partnership with a Board and Directors, specific legal agreements/mechanisms, a long-term strategic plan, annual operating plans and a comprehensive monitoring and evaluation programme. Establishing this formalised multi-stakeholder partnership required a considerable amount of investment over a period of more than two years to provide a sound base for the large-scale interventions to follow. On the contrary, the Klein Swartberg initiative is an initiative that is based on an informal partnership and has developed organically over time with a sequence of small-scale interventions. Nonetheless, the initiative is working towards long-term objectives and specific operational targets that have been set and are monitored annually. In between these two vastly different initiatives is the Skoon Veld initiative in Ceres. This initiative also included the upfront establishment of a formalised partnership, but involved fewer partners, as it is largely a bilateral agreement between the Ceres Business Initiative and the Ceres Local Municipality.

The primary funders varied greatly across the cases, including 1) projects being primarily state funded; 2) a mix of state funding and international donor funding; 3) a mix of state and private funding; 4) primarily private funding supplemented with state and/or international donor funding; and 5) entirely private funded. In several of the cases, Non-Governmental Organisations (NGOs) (e.g. Transnational Corporation (TNC), World Wildlife Fund (WWF), Endangered Wildlife Trust (EWT)) played a key role in driving the initiative and seeking funding, while in the Sihlanzimvelo/Transformative River Management Programme(TRMP) case the primary driver was the eThekwini Municipality, and in the Program Skoon Veld case the primary driver were local businesses through the Ceres Business Initiative (CBI) supported by municipal government funding. In two of the cases, local representatives from civil society organisations were the primary drivers - for the Upland River Conservation case it was the Natal Fly Fishers Club (NFFC) and for the Klein Swartberg case it was the Mountain Club of South Africa.

The clearing of IAPs was the most widespread EI intervention across the nine cases, being at least a component of all the cases and central to several cases, e.g. the TNC GCTWF and Program Skoon Veld cases. Water provisioning was the most common primary ecosystem service driving EI investment across the cases, as IAP clearing assists in water provisioning by freeing up the water that would otherwise be used by the IAPs. In addition, a variety of other interventions were also covered, including physical interventions such as “earthen plugs” designed to re-wet desiccated wetland areas (e.g. for uMhlangane/Riverhorse Valley and Mpophomeni), improved grazing and fire regimes (e.g. for EWT Carbon for Conservation Project), as well as interventions designed to strengthen institutions which support sound EI management (e.g. uMhlathuze Water Stewardship Programme).

Other focal ecosystem services covered in the cases included flood attenuation (e.g. for uMhlangane/Riverhorse Valley), flood conveyance (e.g. for Sihlanzimvelo/TRMP), water quality enhancement (e.g. for Mpophomeni), and carbon storage (for EWT Carbon for Conservation Project). Although one or two ecosystem services served as the primary motivator/driver for EI investment in all cases, this was also generally tied with the more general contribution of EI investment to the maintenance of biodiversity, particularly relevant in cases located in biodiversity hotspots, as is the case for the TNC Greater Cape Town Water Fund. The contribution of EI investment to tourism and recreation ecosystem services was explicitly included in some of the cases, e.g. recreational fishing in the Upland River Conservation case and hiking and nature appreciation in the Klein Swartberg case, and the contribution of EI investment to enhanced aesthetics of a business estate was included in the uMhlangane /Riverhorse Valley case.

The cases encompass a considerable diversity of land tenure and land-use contexts. This included state conservation areas, e.g. as represented across much of the mountain catchment in the Greater Cape Town Water Fund and Klein Swartberg cases, private agricultural land (as was the focus of the EWT Carbon for Conservation Project), communal agricultural land (as included in uMhlathuze Water Stewardship Programme and Mpophomeni cases), private urban land (as included in the uMhlangane/Riverhorse Valley case) and municipal land zoned as green space/corridors (e.g. Sihlanzimvelo/TRMP).

In **Section 3 to 6** four of the cases studies covered in **Table 2-1**, namely 1) the Wolseley Water User Association EI coordinator Initiative, 2) the Mpophomeni-uMthinzima (Upper uMngeni) Initiative, 3) the uMhlangane initiative and 4) the Klein Swartberg initiative , are described in more detail.

Table 2-1 Examples showing the diversity of types EI initiatives, financing arrangements, and scales of investment in South Africa

Factors	uMhlathuze Water Stewardship Partnership	The Nature Conservancy (TNC) Greater Cape Town Water Fund (GCTWF)	Program Skoon Veld - Ceres	Upland River Conservation	The Endangered Wildlife Trust (EWT) Carbon for Conservation Project	uMhlangane Catchment (Riverhorse Valley wetland, Sihlanzimvelo Programme and TRMP)	Mpophomeni	Klein Swartberg	Wolseley Water User Association
Type of EI investment	Public and private sector investment in catchment management and water security, which includes enhancing the management of the freshwater coastal lakes and surface water dam, supporting water use efficiency, facilitate agricultural water stewardship, securing EI and developing community water related champions.	Public-private partnership to facilitate major investment from multiple funders to manage catchments with nature-based solutions, primarily through measures to control IAPs for water security of the Greater Cape Town area.	A private-sector driven partnership to control IAPs in the mountain catchment supplying the Ceres area with water recognized as an economically critical resource to this major fruit-producing area, which is critically dependent on an assured supply of irrigation water.	Private-sector driven riparian rehabilitation in the upper uMngeni catchment. Efforts focus on enabling EI rehabilitation and conservation activities which would not normally be financially sustainable for landowners but would benefit the catchment.	Private-private partnership. A sustainable financing mechanism (carbon-offsetting) is used to invest into improved grassland and wetland management through positively influencing burning and grazing regimes.	An example of cooperative rehabilitation and management of a freshwater EI within an urban landscape, involving investment by public and private sector, civil society organisations. The Sihlanzimvelo and TRMP programmes were initiated with public funding through eThekwini's municipal Operational Expenditure (OpEx) budget, then expanded through Development Financing Institution (DFI) grant funding.	Public investment in the rehabilitation of the uMthinzima Wetland complex as part of built infrastructure development. Rehabilitation of the upstream portion of the wetland was part of the environmental authorization of the development of the Wastewater Treatment Works (WWTW).	Local businesses and farmers investing in the mountain catchment EI on which their water security depends, through the control of IAPs in the catchment supplying Ladismith town with its water.	Continuity of EI maintenance has been sustained through a dedicated EI coordinator appointed into a local institution, acting as a hub for sourcing public and private sector investment in EI, focussed on clearing IAPs.
Water risk factors	Drought; water quantity and quality security.	Water security in the context of assured water supply in a variable climate.	Water security (assured quantity).	Water quality and flow impacts in the context of local recreational fishing and associated tourism (adverse impacts on fish habitat and quality of fishing experience), erosion and land productivity, downstream water security.	Water quality and quantity in Strategic Water Source Areas (SWSAs).	Flood risk reduction /attenuation and water (quality) security in the context of a highly urbanized catchment area. Protection and securing grey infrastructure (public and private).	Water (quality) security in the context of mitigating pollution sources from formal and informal settlement in a key water supply catchment.	Water (quantity) security in the context of assured water supply in a dry and variable climate.	Primarily water (quantity) security in the context of assured water supply. Also, including natural flood conveyance, and therefore flood risk.
Scale	Medium	Very large	Medium	Medium	Large	Medium (catchment scale)	Small	Small	Medium
Catchment	uMhlathuze Catchment.	Multiple catchments supplying the Greater Cape Town area.	The catchment supplying Ceres Town.	The Upper uMngeni catchment (highland areas), expanded into the broader eastern Drakensberg drainage region.	Multiple strategic water source areas.	uMhlangane catchment, located in the Lower uMngeni catchment.	uMngeni.	Gouritz.	Breede.
Land use context	Urban (commercial residential, industry), rural areas,	Predominantly rural mountain catchment areas but including some urban areas.	Rural mountain catchment areas.	Predominantly commercial agriculture.	Agriculture with significant grazing component.	• Urban (commercial, residential, industry). • State, municipal, and private land ownership.	Rapidly expanding residential – informal and formal.	Agricultural, undeveloped, and small town.	Agricultural, primarily irrigated fruit production.
Primary funder(s)	• Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). • National Business Initiative (NBI). • WWF South Africa.	Multiple private and public funders (see partners below).	Predominantly local businesses, but also government funding through the municipality, and some additional funding from WWF's Green Trust.	• Natal Fly Fishers Club (NFFC) through fundraising activities. • WWF South Africa. • Landowners - volunteer and in-kind contributions.	The revenue is earned not funded, through the sale of carbon units.	DFIs, public sector (eThekwini Municipality) and private sector.	Public sector (the Department of Economic Development, Tourism and Environmental Affairs, uMgungundlovu District Municipality, Umgeni Water, Working for Wetlands, Ezemvelo KwaZulu-Natal (KZN)	Private and volunteer sectors: Local businesses in Ladismith and the Gouritz Cluster Biosphere Reserve, plus in-kind contributions by Mountain Club of South Africa (through which the participation of volunteers is promoted), and local	Private and public sector: Woolworths, Coca-Cola, LandCare, Department of Environmental Affairs and Development Planning, Western Cape Government, and Breede-Olifants Catchment Management Agency

Factors	uMhlathuze Water Stewardship Partnership	The Nature Conservancy (TNC) Greater Cape Town Water Fund (GCTWF)	Program Skoon Veld - Ceres	Upland River Conservation	The Endangered Wildlife Trust (EWT) Carbon for Conservation Project	uMhlangane Catchment (Riverhorse Valley wetland, Sihlanzimvelo Programme and TRMP)	Mpophomeni	Klein Swartberg	Wolseley Water User Association
							Wildlife), NGOs (WESSA, DUCT), and civil society (public, citizen scientists, local catchment management and conservancies forums, and research entities).	farmers from the areas surrounding Ladismith.	
Current Partnerships	• Civil society (Proto-CMA Pongola Mzimkulu, WWF). • Government (Department of Water and Sanitation, Transnet). • Industry (Tongaat Hullet, Richards Bay Minerals, Mondi South Africa, Grindrod).	• The Nature Conservancy. • Department of Water and Sanitation. • Department Forestry Fisheries of Environment. • Provincial Department of Environmental Affairs and Development Planning. • City of Cape Town. • South African National Biodiversity Institute (SANBI). • CapeNature. • Coca-Cola. • Peninsula Beverages. • Nedbank. • Remgro Ltd. • WWF.	• Ceres Business Initiative (CBI). • Ceres Local Municipality.	• Natal Fly Fishers Club (NFFC). • local landowners. • WWF. • Upland River Conservation (NPC) local businesses. • Conservancies. • Landowners. • National Government, Natural Resource Management (NRM programme).	• Private landowners, mostly all linked to Biodiversity Stewardship sites (Protected Environments and Nature Reserves). • WeAct (a carbon project developer).	• Private Sector /Business. • NGOs. • Civil society / Community based organisations. • Municipality.	• Private Sector /Business. • NGOs. • Civil society.	• Local business. • Civil society (farmers). • Mountain Club of South Africa. • Cape Nature. • Gouritz Cluster Biosphere Reserve.	• WWF. • Wolseley Water Users Association. • Breede-Olifants Catchment Management Agency. • LandCare.
Key/focus ecosystem service(s)	• Management and restoration of critical water sources in the catchment through wetland rehabilitation and alien invasive species clearing.	• Restoring the ecological infrastructure of priority sub-catchments through invasive alien plant removal as a cost-effective and sustainable means of augmenting water supply for the Greater Cape Town Region.	• Controlling IAPs in a key water supply catchment for improved assurance of water supply and to maintain the biodiversity of the mountain fynbos	• Improved recreational (fishing) opportunities. • Securing downstream water supply. • Enhanced/secured land productivity.	• Grassland and wetlands in terms of below-ground carbon storge and water provision. • Some restorative action in both grasslands and wetlands, achieved primarily through improved grazing and burning management.	• Provisioning (water quality and quantity). • Regulating (flood attenuation). • Biodiversity conservation through habitat protection and enhancement.	• Water quality enhancement and restoration of wetland habitat.	• Water supply and regulation.	• Water supply and regulation.
Year implementation started	2016	2018	2017	2017	2022	2009	2015	2019	2017
Monitoring	• Alien invasive clearing. • Wetland rehabilitation.	• Catchment areas cleared of IAPs are monitored and evaluated to demonstrate impact.	• Clearing operations are monitored and quality checked by the municipality to determine if work is satisfactorily completed.	• Length and area of clearing and revegetation activities recorded, monitoring for regrowth of invasive vegetation, water quality monitoring (river	• Veld condition assessments. • Application of management practices, specifically those related to fire, grazing, and soil organic carbon.	• Clearing and clean-up work undertaken by the co-operatives is monitored by the Municipality. • Endangered Wildlife Trust (EWT) were involved in monitoring following the	• GroundTruth citizen scientists (Enviro-Champs) were responsible for post wetland monitoring activities, while GroundTruth provided the pre rehabilitation monitoring.	• Mountain areas cleared of IAPs are monitored by volunteers and a SAEON developed app is used annually to rapidly estimate the water savings	• Primary monitoring by the EI coordinator and by various other partners, including LandCare.

Factors	uMhlathuze Water Stewardship Partnership	The Nature Conservancy (TNC) Greater Cape Town Water Fund (GCTWF)	Program Skoon Veld - Ceres	Upland River Conservation	The Endangered Wildlife Trust (EWT) Carbon for Conservation Project	uMhlangane Catchment (Riverhorse Valley wetland, Sihlanzimvelo Programme and TRMP)	Mpophomeni	Klein Swartberg	Wolseley Water User Association
				monitors sponsored by local business).	• Below-ground organic carbon.	introduction of the Pickergill's Reed Frog. • GroundTruth has undertaken specialist monitoring undertaken during the rehabilitation activities at the Riverhorse Valley Wetland.		associated with the clearing.	

3. WOLSELEY WATER USER ASSOCIATION EI COORDINATOR INITIATIVE

3.1 Background

The Wolseley Water User Association (WWUA) EI coordinator initiative focuses on a small-scale initiative in the town of Wolseley located in South Africa's Western Cape province (**Figure 3-1**). The farming town is heavily affected by IAPs, particularly in the mountainous farmland north and east of Wolseley. This poses a water risk issue to the town, as these areas are the primary water source areas for the Breede River (Gelderblom et al., 2021). Linked to this, the Breede catchment faces a range of water-related challenges, which affect operations of various stakeholders reliant on its available water resources. These stakeholders include, inter alia, Woolworths, Marks and Spencer (M&S) and the German Society for International Cooperation (GIZ). A key principle that has guided how the EI intervention was implemented, was project ownership, that emphasises that project ownership should be the responsibility of the stakeholders in which the EI intervention or project is located in, rather than it being a responsibility of external organisations. This contributes to ensuring the sustainability of intervention.

Key obstacles hindering the practical operationalisation of EI investment at a local scale are a potential lack of trust, discontinuity (e.g. with potential funding sources changing from year to year) and the difficulty encountered by local role-players in maintaining momentum in the face of multiple competing demands. The appointment of an EI coordinator into the WWUA to support the maintenance and rehabilitation of EI has proven to be an effective means of building trust and maintaining continuity and momentum (Gelderblom et al., 2021). In addition, while the concept of blended funding/finance is conceptually attractive, it can be difficult to operationalise locally, and local EI coordinators offer a promising practical means of facilitating this blending.

In 2017, through facilitation by WWF, long-term private sector funding from Woolworths was secured to appoint a local EI coordinator, Ryno Pienaar, into the WWUA, a position which he currently still occupies. To date, he has coordinated extensive clearing of IAPs in the WWUA operational area in the upper Breede River catchment (**Figure 3-2**).

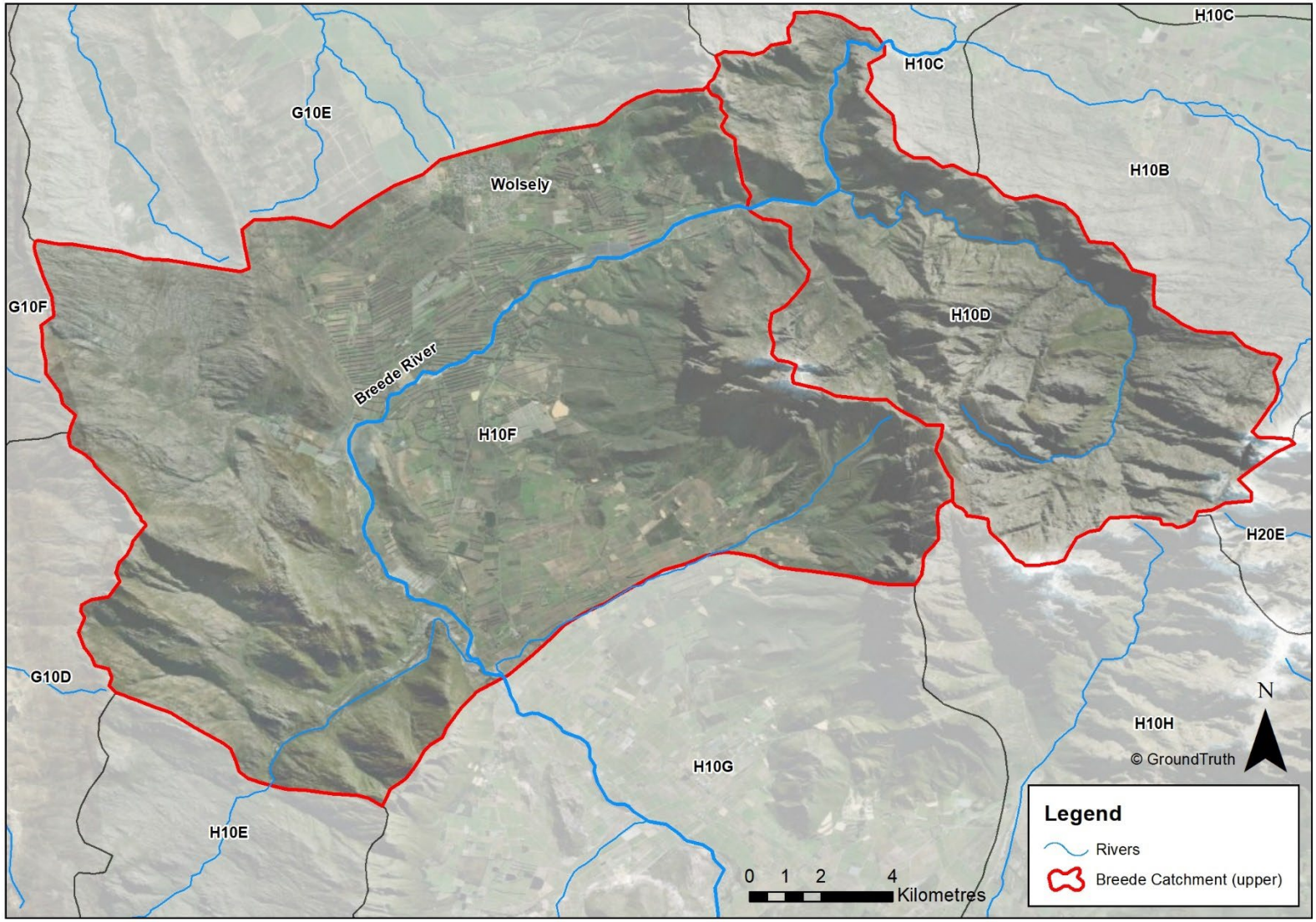

Figure 3-1 Overview of the town of Wolsely and its immediate catchment area

Figure 3-2 The Breede River in the Wolseley area, pictured during the dry season

This investment in EI has been funded from multiple sources including Coca-Cola, LandCare, Department of Environmental Affairs and Development Planning, Western Cape Government, Breede-Olifants Catchment Management Agency, and the WWUA itself. The primary funding source has shifted several times over time, but continuity has largely been maintained, thus allowing for systematic IAP control with timeous follow-up clearing.

3.2 Insights and lessons from stakeholders

The case seeks to document how the WWUA EI coordinator position built on existing private-public sector partnerships, and how this position and its funding have evolved over time. While the ecological outcomes arising out of the EI coordinators work will be briefly mentioned, the primary focus of the case will be on *how* these were achieved.

3.2.1 *Ecosystem service returns (outputs and outcomes) from EI interventions*

The principal ecological output of the initiative is that 2’018 ha of riparian area in the upper Breede River catchment centred around the town of Wolseley has been cleared and kept clear of IAPs, particularly focussing on trees (**Figure 3-3**). In some of this area (approximately 60 ha) the initiative also included active re-establishment of indigenous vegetation along the riverbanks to aid in the ecological recovery process.

Figure 3-3 Clearing underway of a riparian zone in the Wolseley area which is infested with *Acacia saligna*, *Acacia mearnsii* and other invasive alien plants (photo: R Pienaar)

An institutional output of the initiative has been greater landowner commitment to sustained follow-up clearing of IAPs, though, for example, contacting landowners directly to remind them when follow-ups are due and ultimately "nudging" them into a culture of budgeting for follow-ups (Gelderblom et al., 2021). Overall, 120 farmers have formally committed to water stewardship contracts (WWF, 2023).

The principal outcome reported from the clearing of IAPs in the initiative is of 811 900 m^3 of water saved since the clearing started (WWF, 2023). The focus on water quantity in terms of reported outcomes is not surprising given the well-demonstrated effect that IAPs have in diminishing streamflow (Cullis et al., 2007).

Although not reported on specifically, and unlikely to be as marked as the effects of water quantity, the IAP clearing may also have contributed to slightly improved water quality. This is based on the potential negative effects of IAPs on water identified by Chamier et al., (2012).

The generally negative effect of dense infestations of IAPs on biodiversity is well documented (Wilson et al., 2014; Richardson and van Wilgen, 2004; Richardson et al., 1997). Thus, the 2 018 ha of riparian area which has been cleared and kept clear is likely to have had a significant positive effect on the maintenance of biodiversity in the upper Breede catchment. These positive effects are further confirmed by assessments at individual sites within the 2 018 ha area, including at the Kluitjieskraal Wetland. The positive effects on biodiversity of maintaining the Kluitjieskraal Wetland in a cleared state have been documented by Kotze et al., (2023). This includes a positive contribution for several red-listed plant species, including the Vulnerable *Aponogeton angustifolius*, Critically Endangered *Leucadendron chamelaea*, Vulnerable *Leucadendron corymbosum*, Endangered *Monsonia speciosa* and Vulnerable *Skiatophytum tripolium*as, as well for avifauna, including the regionally endangered African Marsh Harrier (*Circus ranivorus*) and the Endangered Black Harrier (*Circus maurus*).

3.2.2 *Relevance of the returns to key role players and funders/investors*

The water quantity returns of the initiative have tremendous relevance to the involved farmers (who depend strongly on the water for irrigating their crops) and to WWUA who represent these farmers

and other local water users. It is also of particular relevance to the Breede-Olifants Catchment Management Agency (BOCMA) who represent the flow requirements of downstream ecosystems and water users. It has further relevance to LandCare, particularly in terms of aligning with the land and water stewardship goals of this programme, while the joint returns in terms of water yield and biodiversity are of high relevance to WWF and the principal funder of the local EI coordinator, Woolworths, as part of its commitment to sustainability.

3.2.3 *Role players involved in planning, funding, and implementing the EI investments?*

The Wolseley local EI coordinator initiative builds strongly on a very well-developed base of partnerships, trust and concrete action which were already well established when it was initiated in 2017. The first of these is the partnerships forged between LandCare and farmers in the Wolseley area focussed on supporting the clearing of IAPs in riparian areas, and which began in the early 2000s and continued growing gradually up until commencement of the initiative. The second key partnership is between WWF and Woolworths, which began in 2008 working with suppliers and customers to develop a culture of sustainability all the way through the Woolworths value chain (WWF, 2023). Some of Woolworths important suppliers are farmers in the Wolseley area, highlighting a key overlap between these two partnerships, from which the initiative commencing in 2017 could logically be developed. A further factor contributing to the base on which the initiative grew was the Water Risk Filter process conducted by Marks and Spencer in the United Kingdom (UK), which played a key role in supporting Woolworths now ongoing water stewardship work in the upper Breede River valley and elsewhere in South Africa (NBI, 2019).

Once established and running, multiple role-players have been involved, including >10 different funders (**see Subsection 3.2.3**). The large number of different funders and the fact that many had a duration of only a year or two, highlights the tremendous need for continuity and coordination. For EI investment in general, key obstacles hindering the practical operationalisation of EI investment at a local scale are a potential lack of trust, discontinuity in the funding stream and the difficulty encountered by local role-players in maintaining momentum in the face of multiple competing demands. The appointment of an EI coordinator into a local institution to support the maintenance and rehabilitation of EI has proven to be a very effective means of building trust and maintaining continuity and momentum (Gelderblom et al., 2021). In addition, while the concept of blended funding/finance is conceptually attractive, it can be difficult to operationalise, and the local EI coordinator offered a practical means of facilitating this blending from multiple sources.

3.2.4 *Funding structures*

The WWUA has been the main hub through which much of the funds are administered, and the local EI coordinator is “hosted” by the WWUA. In addition, Breedekloof Wine and Tourism have also contributed to administering some of the funds. Woolworths continued to fund the coordinator, who in turn continued to secure and coordinate considerable funding for the IAP clearing and restoration work itself (**Table 3-1**).

Funding has been accessed from multiple sources, for which the largest proportion is from government grants (**Table 3-1**), through LandCare, Department of Forestry, Fisheries and the Environment (DFFE), and Department of Environmental Affairs and Development Planning of the Western Cape Government (DEADP), and the South African National Biodiversity Institute (SANBI).

The next greatest contribution was from social enterprise investments (Reforest'Action), which funded the planting of indigenous trees and shrubs in some of the areas cleared of IAPs through selling this investment as carbon credits on the global market. This was followed by private enterprise grants from two businesses (Coca-Cola and Hilton Hotels) for clearing IAPs, and next by the BOCMA (**Table 3-1**).

Table 3-1 Primary sources of funding for work undertaken through the Wolseley local EI coordinator initiative for the overall period 2017-2023

Category of funding	Amount	Percentage
Government grants	R28 573 903.00	67.6%
Breede Olifants Catchment Management Agency (BOCMA) grants[1]	R2 743 000.00	6.5%
Wolseley Water User Association grants	R100 000.00	0.2%
Private enterprise grants	R4 135 525.00	9.8%
Social enterprise investments	R6 000 000.00	14.2%
NGO grants	R700 000.00	1.7%
Total:	**R42 252 428.00**	**100%**

[1]The funding source for the grants from BOCMA can be taken as a split between national treasury and water levies, which each constitute 50% of BOCMA's income.

[2]The social enterprise specialised in reforestation and was a B Corp-certified social enterprise, which is a for-profit business that has been certified by the non-profit organization B Lab in terms of verified social and environmental performance, public transparency, and legal accountability to "balance profit and purpose" (https://www.greeneconomylaw.com/social-enterprises-b-corps-benefit-companies-esg).

Much of the funding for the initiative was sourced through responding to calls for work through an open-tender process, including calls from government as well as calls from private companies, such as that from Coca-Cola. The EI co-ordinator played a central role in "watching out" for potentially relevant calls and then, in collaboration with partners, developing and submitting proposals. Partners also contributed to alerting the EI co-ordinator to potential funding sources, the most notable of these being LandCare alerting the EI co-ordinator to Reforest'Action as a potential source of major funding. While it appeared to be a "long shot" at the time, the application for this major source of funding was successful.

3.2.5 *Funding mechanism applied and criteria for securing funding*

In the timeline of funding sources shown in **Table 3-2**, it can be seen how the funding sources have shifted significantly. Although government funding has remained an important contributor in all the years, its relative contribution has fluctuated, and it has noticeably declined in the last three (3) years. This gap has been filled by a "new arrival" in 2021 of a social investment contribution, with its proportional contribution increasing over the three-year period, to become the greatest contributor in 2023.

The short duration (sometimes only a year or two) of many of the funding sources presented a challenge for maintaining continuity over time. However, the fact that in all the years except for the first year (2017), multiple streams of finance have been accessed for the year has helped stabilise overall funding and maintain continuity over the years, thus allowing for systematic IAP control with timeous follow-up clearing. Further contributing to this continuity is the fact that most of the funders have generally been closely aligned with the central focus of the EI investment, namely the clearing of IAPs in riparian areas. For all these funders, the key criterion for securing funding through the initiative

is demonstrating that the IAPs have been effectively cleared. However, the scope of EI investment work has expanded in recent years, in particular, with the arrival of a funder specifically focussed on the replanting of indigenous trees and shrubs in the cleared areas.

Table 3-2 Primary sources of funding for work undertaken through the Wolseley local EI coordinator initiative according to the individual years, 2017-2023

	2017	2018	2019	2020	2021	2022	2023
Total funds:	R3 500 000	R2 014 000	R10 104 293	R7 654 254	R8 900 880	R7 494 000	R5 585 000
Category of funding							
Government grants	100%	35.5%	58.5%	87.8%	66.3%	54%	32%
BOCMA grants	0%	24.8%	4.9%	6.5%	0%	6%	14.3%
WWUA grants	0%	5%	0%	0%	0%	0%	0%
Private enterprise grants	0%	0%	36.6%	5.7%	0%	0%	0%
Social enterprise investments	0%	0%	0%	0%	33.7%	40%	53.7%
NGO grants	0%	34.8%	0%	0%	0%	0%	0%

For funding sourced from the private sector, WWF have played an important role in helping to pitch the proposal in a way that "spoke" to the particular criteria and preferences of the funder. For this, WWF were able to draw on their long-standing experience of working with the private sector.

3.2.6 *Business case for investment in water-related EI*

The business case which was developed for the establishment of the EI coordinator post was based strongly around sustainable production, water stewardship and reducing water-related risk. Once established and running, the emphasis of the business case varied depending on the particular donors being approached, but the most prominent themes running through all of these was that of water security, water stewardship, and reducing water-related risk, allied with poverty relief.

From what can be gleaned, the business case put forward to funders was not generally based on detailed quantified evidence of outcomes but did make good use of the tangible results already achieved in preceding projects in the upper Breede catchment. Drawing the attention of potential funders to this existing "good track record" helped increase confidence that any further funding provided would not be misspent and would to be used to continue with what had already been achieved but across a greater spatial extent of riparian area and therefore amplifying the outcomes.

3.2.7 *Extent to which the EI investment contributed to social justice*

Through the initiative, 109'445 days of employment were provided. Several of the contracts contributing to these days had >50% representation of females amongst the workers. In addition, through the initiative, seven (7) Small, Medium and Micro Enterprises (SMMEs) were established, owned, and operated predominantly by individuals from historically disadvantaged groups. Thus, overall, the direct contribution of the initiative to social justice is substantial.

In addition, the increased water yield resulting from the initiative is anticipated to have buffering effect during drought periods, thus potentially reducing the degree of agricultural production and thereby causing labour to be shed and vulnerable unskilled workers to lose their jobs. Therefore, the

initiative also potentially contributed indirectly to social justice, but this would be contingent on how the water, which is freed up, is allocated and used.

3.2.8 *Key lessons learnt from the initiative*

Key lessons

Where they already exist, it is important to build on existing partnerships, including private-public sector partnerships, and the long-established relationships of trust associated with these partnerships. This is particularly so considering how trust often takes many years to build.

It is of great value that the local EI coordinator be housed within a local organisation with strong local credibility. This is linked with the importance of trust, the need for the EI coordinator to be seen, as far as possible, and to be part of the local community. It also links with the need for encouraging local ownership of the EI investment.

A high level of flexibility is required to accommodate multiple funding sources. This is enabled by having a dedicated individual who is specifically focussed on EI investment, well connected with key role-players and not constrained institutionally from working easily across multiple projects and organisations.

Without the focused attention given by a local EI coordinator to the considerable planning, coordination and administration required for such extensive IA P clearing operations from so many different funding sources, the continuity of work and sustained momentum achieved is likely to have been much lower. Furthermore, the total funds secured would have likely been considerably less and the scale of work carried out to improve the state of the EI therefore much smaller.

The Wolseley initiative's diverse mix of partners, ranging from local to provincial, to national, and to private and public funders, further contributed to its capacity for accessing funding from a variety of sources. For local initiatives, the process of securing certain government funding for EI can be very onerous, largely placing such funds "out of reach". However, through partnerships with government organisations familiar with these procedures, such funds can be much more readily accessed. In the case of the Presidential Employment Stimulus Fund, which was launched during the COVID pandemic, the SANBI's Ecological Infrastructure for Water Security (EI4WS) programme, as one of the partners of the Wolseley initiative, played a critical role in the initiative being able to successfully apply for these funds, which were used for their ongoing clearing of IAPs in the Wolseley area. SANBI were also able to contribute to the initiative's mapping of the clearing efforts through their existing engagement with a national youth employment initiative.

Scalability

The initiative has already demonstrated significant scalability in that major funding (>R45 million) has been secured over a long period (7 years) from multiple sources (>10) and effectively put to use at a large spatial scale (>2 000 ha of riparian area cleared), as elaborated upon in **Subsection 3.2.1**. Further demonstrating its scalability is that through the WWF-Woolworths partnership, an additional local EI coordinator has been appointed in the Koue Bokkeveld area and two more local EI coordinators are planned at additional locations (WWF, 2023). It is important to recognise, however, that a local EI coordinator is not a "silver bullet" and there are some important pre-conditions for its effectiveness and long-term viability, including the following.

- A suitable and supportive organisational "home" for the EI coordinator. The organisation needs to be both functional and adequately resourced and needs to give the coordinator sufficient agency (Gelderblom et al., 2021).
- Stakeholders understand what can be done through a local EI coordinator and the potential partnerships which are linked with this coordinator and are supportive of the initiative (Gelderblom et al., 2021).
- A high level of competency on the part of the EI coordinator is required both in terms of day-to-day operations of the IAP clearing and other EI interventions (including administration, budgeting, monitoring, and evaluation of work executed, reporting and staff management) as well as in terms of strategic planning and the "soft skills" of dealing with a diversity of stakeholders and partners.
- The EI coordinator needs to be the "right fit" for the local community, e.g. in terms of being well conversant in the local language (Gelderblom et al., 2021).
- Adequate funding is required for the EI coordinator, and for continuity, this should preferably be assured for several years.
- Preferably some existing initiatives in the local area on which to build. Without this, there is likely to be a long lead-in time for operational funding to be procured and for there to be tangible outcomes to show on the ground.

A key factor affecting the "scaling out" of any initiative such as that at Wolseley, is an understanding of how to match the needs of the EI with the needs of potential funders. For example, while the Wolseley initiative was able to successfully harness a valuable income stream from the carbon credit market for planting of indigenous trees, the specific requirements and criteria of this specific market precludes financing of IAPs clearing, which therefore needs to come from an alternative funding source. As alluded to in **Subsection 3.2.4,** through BOCMA's contribution, some funding of clearing IAPs has been from water users in the Breede catchment through water levy payments. However, as seen in **Table 3-2**, this constituted a relatively small proportion of the overall finances for the EI work undertaken. Nevertheless, the legal and institutional mechanisms are already in place (e.g. through an increase in the water levy) for significantly increasing the income stream from water users into clearing of IAP s in the catchment which supplies the water which is used. As funding from national treasury for EI work continues to shrink, this source of funding linked to direct water use represents a promising alternative that could become a critical means of financing IAPs clearing within the upper Breede and other key water supply catchments.

4. THE MPOPHOMENI-UMTHINZIMA (UPPER UMNGENI) INITIATIVE

4.1 Background

This case focuses on the Mpophomeni-uMthinzima Stream initiative, located in the upper uMngeni catchment in KwaZulu-Natal. The initiative is aimed at improving and maintaining the water quality of the uMthinzima Stream through wetland rehabilitation, improved grey infrastructure and raising environmental awareness and citizen science action (Browne and Mugwedi, 2017). The uMthinzima Stream runs through, and downstream of the Mpophomeni housing settlement and flows directly into Midmar Dam (a key water reservoir within the regional water supply network) (Ward, 2016). The settlement forms part of the largest area of high-density housing within the upper uMngeni catchment and is within close proximity to Midmar Dam. The uMthinzima Stream catchment, comprising mostly of the Mpophomeni settlement, has a history of poor water quality with *E. coli* levels significantly higher than target water quality ranges. According to Lotz-Sisitika et al., (2021), in 2014, "Mpophomeni contributed 51% of the *E. coli* and 15% of the phosphorus load in Midmar" (p. 33).

Drivers of poor water quality in the system include (interrelated) (Felton, 2023; Jewitt et al., 2020; UMDM, 2016):

- Failing and in-sufficient wastewater and stormwater infrastructure.
- Ineffective/missing solid waste collection systems.
- Misuse of wastewater/sewer infrastructure by residents of Mpophomeni.
- Degraded ecological infrastructure (wetlands and riparian areas) (intensive livestock grazing, contaminated water inputs, encroachment of alien invasive vegetation, and channel and flow modifications).

The wetland complex of the uMthinzima stream is a critical area of ecological infrastructure that serves to assist in protecting the water resources of Midmar Dam from the urban impacts of the high-density Mpophomeni settlement (uMthinzima-Mpophomeni Wetland Rehabilitation Project proposal) (**Figure 4-1**). The wetland system associated with the uMthinzima Stream has been significantly degraded due to anthropogenic impacts. However, even in this degraded state, water quality monitoring results showed that the wetland was having a positive influence on water quality enhancement. Ecological assessments indicated that this influence could be increased through the active rehabilitation of the wetland, thereby enhancing the overall functioning of the system (Jewitt et al., 2020). However, this would be subject to input from a suite of stakeholders. **Figure 4-2** below provides a snapshot summary of the initiated projects and implemented wetland interventions undertaken to rehabilitate the Mpophomeni-uMthinzima wetland complex. These projects and interventions are discussed in more detail below.

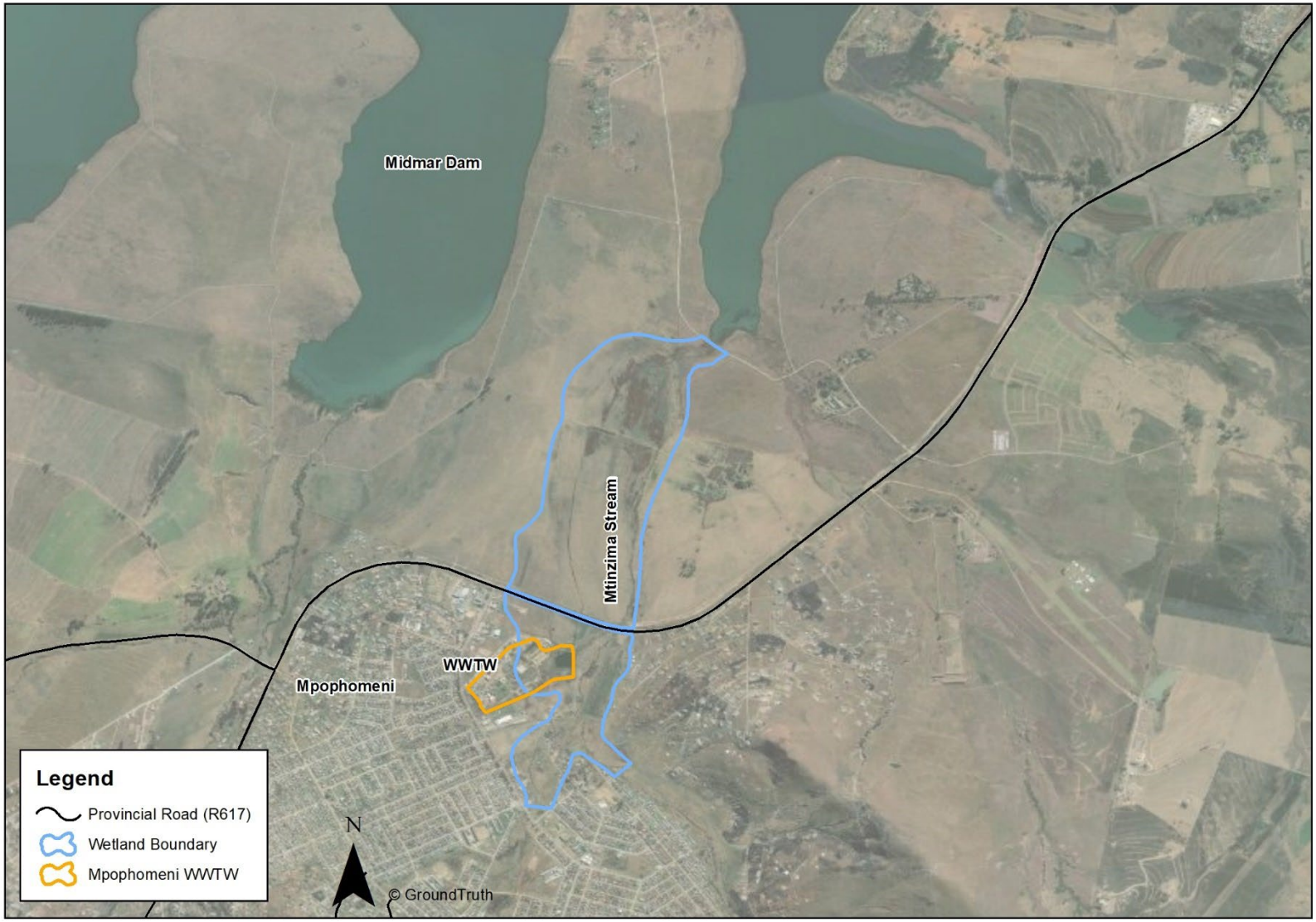

Figure 4-1 Overview of the uMthinzima wetland in relation to the Mpophomeni settlement and Midmar Dam

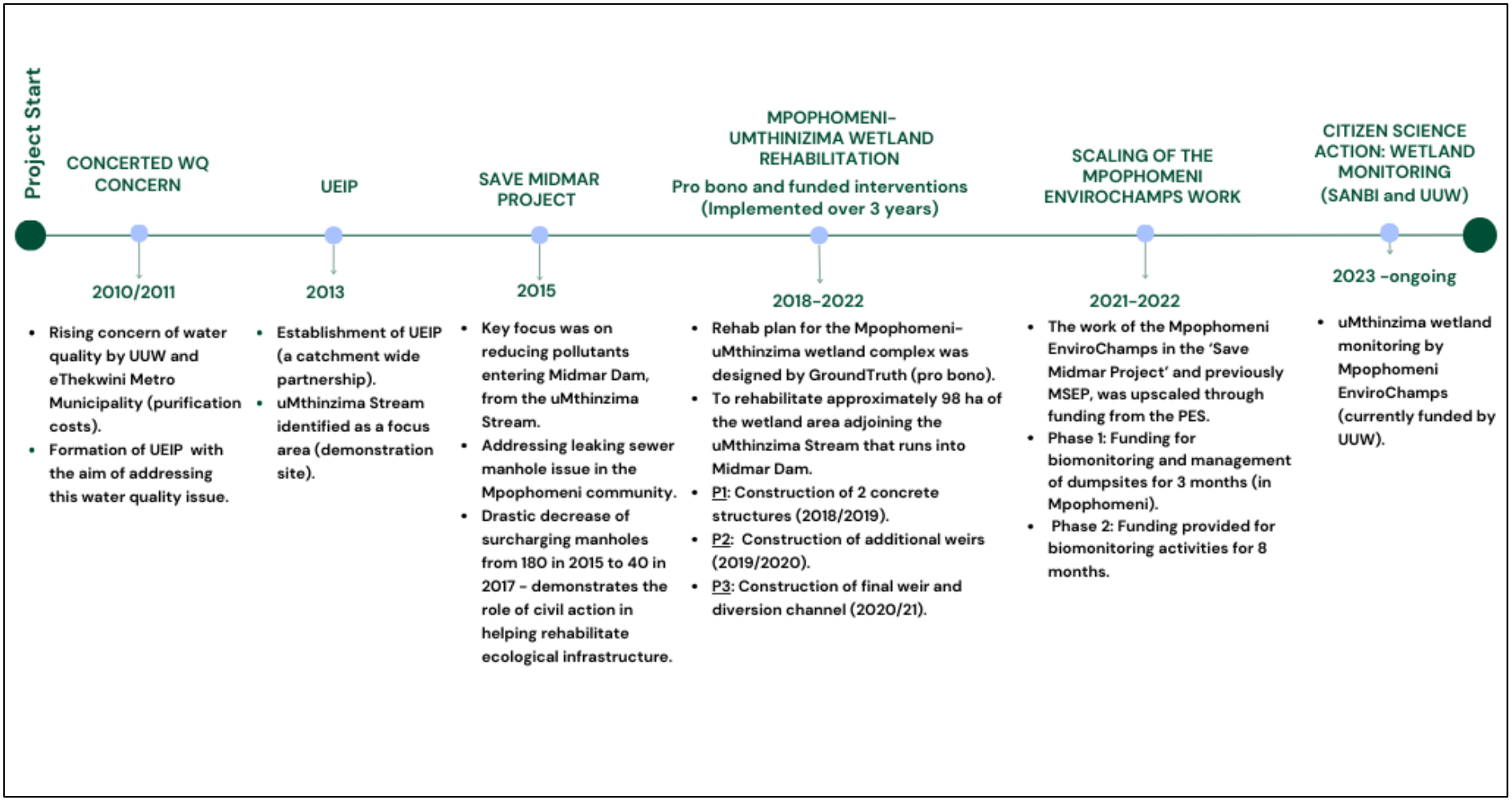

Figure 4-2 Timeline for of projects initiated and activities undertaken to rehabilitate the Mpophomeni-uMthinzima wetland ecosystems

Box 1: Origin and development of the initiative

The Mpophomeni-uMthinzima initiative came about through the convergence of several developments occurring at the time. The main elements of these and some of the key milestones are outlined below (Felton, 2023; UMDM, 2016.).

During 2010/2011, attention to the water quality in the uMngeni system increased from several groups. eThekwini Metro Municipality and uMngeni-uThukela Water (UUW) were concerned about the rising costs associated with the purification of water. Organisers, participants, and the media raised concerns regarding declining water quality and health implications for the Duzi canoe marathon participants. Researchers, practitioners, and organisations (e.g. South African National Biodiversity Institute (SANBI), were increasingly investigating and raising awareness about the linkages between the condition of EI, catchment use and management, and water security (quality and quantity) implications. This attention, along with declining water quality in many of the systems of the uMngeni catchment and the rising demand for water catalysed the formation of a catchment-wide partnership, the Umgeni Ecological Infrastructure Partnership (UEIP), in 2013. The initial development of the partnership was led by several organisations including the SANBI, eThekwini Metropolitan Municipality, the KwaZulu-Natal office of the Department of Water and Sanitation, and UUW (previously referred to as Umgeni Water).

After further consideration, the scale of the initiative was recognised as too large for a 'demonstration site'. The uMthinzima Stream was identified as a suitable focus area for several converging reasons, both from a biophysical perspective, but also from the strong potential for multi-sector collaboration, through:

- An opportunity to collaborate with, and support, the Mpophomeni Sanitation and Environment Programme (MSEP) (which has since evolved into the Enviro-Champs model) in response to waste management challenges in the Mpophomeni Settlement (solid waste management challenges and frequent sewer blockages and spills) (NGO led partnership).
- The planned construction of a new Wastewater Treatment Works (WWTW) in Mpophomeni and the potential to integrate grey infrastructure development and EI investment.
- The building of the WWTW came about from the proposed development of a new residential settlement near Mpophomeni (the Khayelitsha Settlement) and the potential pressure this settlement would have on the Howick WWTW. To alleviate increased pressure of raw sewage loads on the Howick WWTW, it was proposed that the Mpophomeni WWTW be upgraded (GroundTruth, 2010). The WWTW was included as a condition of approval for the new development.
- An active Upper uMngeni Catchment Management forum, which were 'looking' at EI investment options and had identified the uMthinzima wetland.

A consortium of stakeholders has been and are still involved in the Mpophomeni-uMthinzima Stream initiative. This includes the uMgungundlovu District Municipality (government), UUW (government), local community citizen scientists (commonly referred to as Enviro-Champs), local landowners (tribal/community trust), Wildlife and Environment Society of South Africa (WESSA), Duzi-uMngeni Conservation Trust (DUCT) (NGOs), NRM - Working for Wetlands (government programmes), GroundTruth (private – consulting), local catchment management and conservancies forums and other partners of the uMngeni Ecological Infrastructure Partnership (UEIP) convened by SANBI. **Table 4-1** below summarises the role players involved in the different activities and phases of the project.

Table 4-1 Summary of role-players involved in different phases of the Mpophomeni-uMthinzima (upper uMngeni) initiative

Project phase	Mpophomeni WWTW wetland rehabilitation	uMthinzima Stream Wetland rehabilitation	Enviro-Champs (wetland monitoring)
Planning	uMngeni-uThukela Water GroundTruth	**EDTEA (Ian Felton)** identified the opportunity for the rehabilitation of the uMthinzima Wetland and the crucial role wetlands can play in purifying the water flowing from the uMthinzima stream, entering Midmar Dam. **GroundTruth** were responsible for developing the initial wetland rehabilitation plan for the uMthinzima wetland, which was then shared with the Zenzele Community group. Eastern Wetland Rehabilitation – Private (Pvt) uMgungundlovu District Municipality (UMDM) Government (Govt.)	WESSA (NGO) /DUCT – Non-Profit Organisation (NPO): **Bab Cele** (a long-standing Enviro-Champ) was involved in the initial planning meetings leading up to the implementation of the wetland rehabilitation project. His vast experience as an Enviro-Champ and understanding of the environmental challenges faced in the community was critical in informing the planning of the rehabilitation project.
Funding	UUW	**National NRM (Govt.),** specifically, the *Working for Wetlands (WfWet)* programme, funded the initial wetland rehabilitation plan, specifically the labour-intensive activities and the authorisation process. **UUW (Govt.)** provided funding for the materials required for the engineered infrastructure of the wetland. **UMDM (Govt)** provided in-kind contributions for the overall management and co-ordination of the project.	UMDM (Govt.). Other (through WESSA/DUCT) (NPO - Donor). **UUW (Govt.), SANBI and GroundTruth (Pvt):** *Phase 1:* Through funding from SANBI the Mpophomeni Enviro-Champs were employed to conduct the first phase of wetland monitoring. Further, GroundTruth provided wetland monitoring training in 2022, through the Wetlands Key Concepts course. *Phase 2:* The Enviro-Champs were funded by UUW to continue monitoring of the uMthinzima wetland, which included training provided through GroundTruth.
Implementing	uMngeni-uThukela Water	**Eastern Wetland Rehabilitation** was contracted by the National NRM programme to implement the initial rehabilitation activities. **GroundTruth**: was employed to implement the earthworks (engineered infrastructure) and conduct the training.	WESSA/DUCT (NPO). GroundTruth (Pvt).

Through the UEIP, an initiative was established to create and support three EI investment demonstration sites within the greater uMngeni Catchment. These were to be funded through donor funds, initially GEF 5 funds, channelled through SANBI's Biodiversity and Land Use (BLU) project. The greater uMngeni Catchment was identified as one option and, initially, the 'Save the Midmar Dam' initiative was conceptualised which would encompass the Midmar Dam catchment and be championed by UMDM through pro-bono support of a 'UMDM co-ordinator'. The initiative initially aimed to address a range of the drivers associated with poor water quality of three tributaries flowing into Midmar dam, through several strategies.

A strategic plan was developed (by the UMDM co-ordinator with stakeholders) to tackle water quality related issues in the uMthinzima Stream. This plan recognises the necessity for coordinated actions across various focus areas, with a particular emphasis on the integration of built grey infrastructure and EI linkages. The focus areas included:

- Management of sewer spills in the Mpophomeni settlement through community engagement activities (i.e. door-to-door education and drama/street theatre) and sewer monitoring using citizen science tools.
- Sewer infrastructure challenges, recognising that it would not be realistic to address this completely through the initiative given the major structural challenges of the existing infrastructure, but to look for opportunities for rehabilitation of water-related ecological infrastructure linked to the sewer infrastructure.
- Sanitation and environmental awareness raising and capacity building, supporting the work by DUCT and WESSA, which had achieved strong traction and developed personal agency within citizens.
- Solid waste management (uMngeni Local Municipality).
- EI rehabilitation (uMthinzima wetland complex).

As the project progressed, the 'sanitation, environment awareness raising and capacity building', along with the 'rehabilitation of the uMthinzima Wetland' focus areas gained the most traction. This can potentially be attributed to the critical connection of these focus areas to a key water source, Midmar Dam, and the value of environmental awareness raising to the community. The original Mpophomeni Sanitation and Environment Programme (MSEP) developed into the EnviroChamps initiative, which has been running for over 10 years and has been funded by varied organisations over the years (discussed further in later sections).

Mpophomeni - uMthinzima Wetland Rehabilitation Projects

The wetland rehabilitation component of this case description encompasses the interventions implemented for two different portions of the uMthinzima Stream Wetland complex each funded and managed separately and involving different role-players. An overview of the two projects and associated funding arrangements and role players is provided in **Table 4-2.**

Table 4-2 Overview of the two uMthinzima Wetland Rehabilitation projects

	Mpophomeni WWTW wetland rehabilitation	uMthinzima Stream Wetland rehabilitation
EI type	Channelled valley-bottom wetland	Channelled valley-bottom wetland
EI intervention	Wetland rehabilitation and on-going maintenance	
Objective	Enhance the ecosystem services specifically associated with water quality of the wetland	

	Mpophomeni WWTW wetland rehabilitation	uMthinzima Stream Wetland rehabilitation
Landowner	State	Communal Land (Trust)
Driver (of the rehabilitation investment)	A condition of the Environmental Authorisation (2014) for the WWTW and associated reticulation (pipeline)	UEIP Demonstration Site
Role-players	UMDM, uMngeni-uThukela Water	UMDM, SANBI, DUCT/WESSA, GroundTruth, uMngeni-uThukela Water
Funders	uMngeni-uThukela Water (State-owned entity)	Multiple, funders and fund sources varied over the project life. Different sources of funds for different aspects (hard/soft interventions, monitoring). No funds directly from private sector companies or civil society.
Fund types	Public (state) funds	Donor grants, and in-kind contributions.
Planner	Consultant (GroundTruth) – as part of EA process (2014 & 2015)	Consultant (GroundTruth) – pro-bono (2015)
Implementer and implementation timeframe	uMngeni-uThukela Water is the implementer of the WWTW development, which includes the wetland rehabilitation. Construction commenced in January 2020 and completion is scheduled for 2024.	Eastern Wetland Rehabilitation 2017 - 2019

GroundTruth was responsible for developing a wetland rehabilitation plan for the Mpophomeni and uMthinzima wetland ecosystems, as a part of a requirement (to obtain environmental authorisation and a water license) for the upgrade of the Mpophomeni sewage infrastructure. The wetland rehabilitation was aimed at improving the water quality of the uMthinzima wetland complex, downstream of R617, prior to decanting into the Midmar Dam. It is worth noting that rehabilitation efforts proposed by GroundTruth, were strictly limited to the wetland area downstream of R617 (GroundTruth, 2015). The portion of the wetland that was intended to be rehabilitated was 98.01 ha. An assessment of the wetland habitat was conducted by the GroundTruth team, which provided biophysical, hydrological, geomorphological and vegetative information on the state of the wetland. The assessment found that, the wetland was heavily impacted by various factors, including inter alia, encroachment of IAPs, intense agricultural activities and intensive grazing by livestock. To alter the wetland conditions into the desired seasonal/permanent wetness conditions, hard and soft interventions were proposed (as described in some of the subsections below).

Citizen Science Action: Water Quality monitoring of the uMthinzima stream by the Mpophomeni EnviroChamps

Mpophomeni Sanitation and Environment Programme

The original Mpophomeni Sanitation and Environment Programme (MSEP), which ran from November 2011 to January 2013, funded by UMDM, was the first community driven response in the Mpophomeni community, which aimed to increase awareness and educate the community of water quality challenges being faced, as related to the greater uMngeni river system (Taylor, 2013). The

MSEP project, which consisted of ten (10) Enviro-Champs [1](environmental champions) had the following key objectives:

- Raise community awareness of environmental issues in the Mpophomeni community.
- Identify Enviro-Champs (local citizens) that would make efforts to address the environmental concerns identified in the Mpophomeni community.
- Monitoring and reporting leaking sewer manholes.

Pictured below (**Figure 4-3**) is a Mpophomeni Enviro-Champ working in the MSEP project, viewing one of the leaking manholes flowing into the uMthinzima stream, and subsequently Midmar Dam (which is situated less than 4 km downstream of the Mpophomeni settlement).

Figure 4-3 Athandwa Thusi (one of the Mpophomeni Enviro-Champs) viewing the spilling manhole in view of Midmar Dam (23 April 2012) [source: Taylor, Interim Report - November 2011 to January 2013]

Enviro-Champs

Over the three-year span of the Save Midmar Project, the following milestones were achieved:

- A total of 7 000 households were visited for the door-to-door campaign to increase environmental awareness. Topics covered during the door-to-door campaigns included waste collection and toilet management (including information on what is disposable in toilets to prevent blockages).
- The trend in surcharging manholes decreased drastically from 180 in 2015 down to 40 in 2017 (**Figure 4-4**) (DUCT, 2018). This marked decrease in surcharging manholes shows the impact of the sewer monitoring work of the Mpophomeni Enviro-Champs, and effectively the role of

[1] Enviro-Champs formally referred to as environmental champions, are community members who are trained to monitor water quality and report on water pollution sources in their community. The movement gained popularity through the Mpophomeni Enviro-Champs, who worked with municipal management to address waste and water quality issues in the Mpophomeni community (Pattinson et al. 2023).

civil action in helping to ensure that the rehabilitated EI did not receive as much contaminated water.

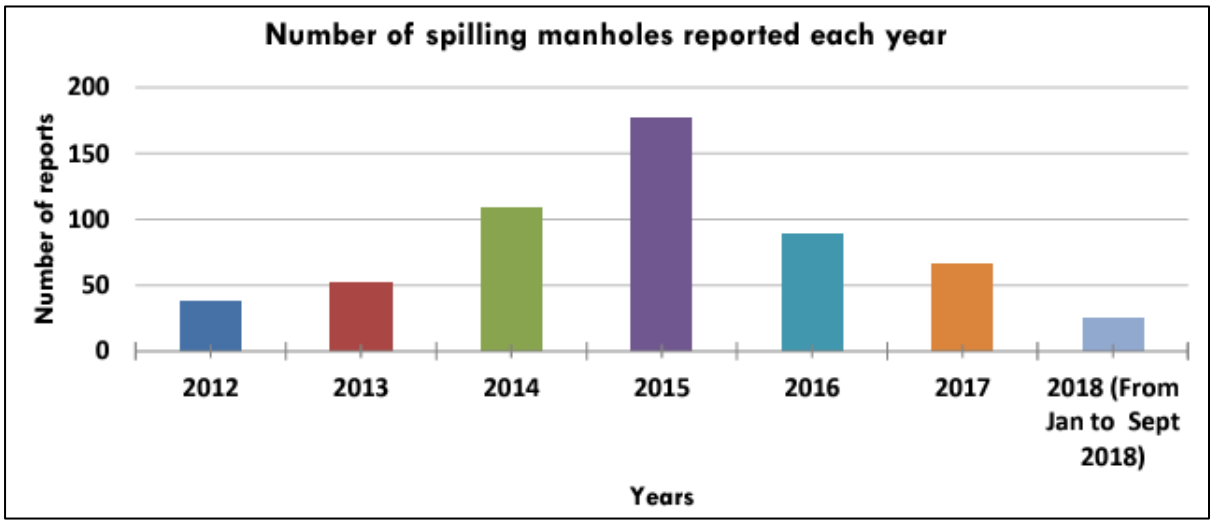

Figure 4-4 Number of surcharging manholes recorded from 2012 to 2018 [source: EPWP Save Midmar Project, 2017]

However, the work of the Mpophomeni Enviro-Champs did not resolve other persisting issues within the Mpophomeni area including the maintenance and upgrade of the WWTW and associated sewage infrastructure system. These persisting water quality issues highlighted the necessity of the continuation of the work of the Enviro-Champs programme within Mpophomeni. Owing to this, the MSEP and Save Midmar Dam project, later developed into the Enviro-Champs initiative, which has been running for over 10 years and funded through a range of ways over the years (discussed in later sections).

One of the ways the Enviro-Champs model has been scaled and implemented across South Africa has been through the Amanzi Ethu Nobuntu Programme.

Amanzi Ethu Nobuntu Programme (AEN)

The Amanzi Ethu Nobuntu Programme (AEN)[2], a flagship project of the uMngeni Ecological Infrastructure Project (UEIP) and a multi-partner blended Community-Public-Private Partnership (CPPP), was aimed at addressing and improving the ecological health of the uMngeni, Upper-Mooi and Umkhomazi catchments. The programme came about in 2021 and was funded by the Presidential Employment Stimulus (PES[3]) Programme through the Department of Science and Innovation (DSI) who provided a funding amount of R5.2 million to DUCT (the lead organisation) for a period of three months, which had to be supported by co-funding for a team of ten (Enviro-Champs) which was raised by partners in the UEIP. The programme provided opportunity for a range of existing and newly

[2] The Amanzi Ethu Nobuntu (AEN) Programme was a Department of Science and Innovation (DSI) funded project aimed at capacitating local citizens with skills and biomonitoring tools to be champions of the environment (Enviro-Champs), in their local community. Local citizens were responsible for adopting a stretch of river adjacent to their homes and rehabilitate it through cleaning, maintaining and restoring its ecological health using citizen science tools (DUCT, 2021).

[3] The Presidential Employment Stimulus (PES) programme is a government-funded programme that was established to alleviate youth unemployment proliferated by the COVID-19 pandemic. This initiative has enabled rapid public employment and upscaling several employment programmes within a short space of time.

developed Enviro-Champs initiatives across South Africa to be upscaled and implemented. Each Enviro-Champ team conducted a diverse range of conservation activities such as IAP and illegal dumpsite clearing as related to their project objectives. The minimum co-funding requirement for the partners was R45 000 of which the partners managed to raise a total of R1 million in phase 1. The co-funding was used to cover costs excluded from the DSI funding[4], which included i*nter alia*, mobile data, management fees, marketing, and monitoring and evaluation of the project. Co-funding was elicited from a range of stakeholders including local and provincial government, civil society, private sector and research institutions. Phase 2 of the AEN programme was also funded through DSI for a period of eight (8) months who provided a total budget of R2 4 000 000 and with a co-funding requirement of R2 5 000 000 (DUCT, 2021). The AEN programme provided an opportunity for the Mpophomeni Enviro-Champs work to continue efforts towards improving the water quality of the uMthinzima river system.

4.2 Insights and lessons from stakeholders

Key lessons and experiences of the uMthinzima Stream and wetland rehabilitation activities highlighted by both stakeholders and through a review of available data and reports are summarised below.

4.2.1 *Ecosystem service returns (outputs and outcomes) from EI interventions*

The main objective of the wetland EI intervention was to rehabilitate approximately 98 ha of wetland habitat adjoining the uMthinzima Stream that runs into Midmar Dam, with the primary goal to optimise the ecosystem services associated with water quality enhancement. Ultimately contributing towards the protection of the state of the water quality in the Midmar Dam.

The implementation was undertaken in 3 phases over 3 years:

Phase 1, 2018/19 included the construction of two concrete structures (**Figure 4-5**) and the creation of earthen berms. Following the construction (within six months), indications were that the interventions were already having a positive impact through improving the hydrology of the system and rewetting portions of wetland habitat that previously were desiccated, and thereby increasing the extent of functional wetland habitat.

[4] The DSI funding was also used to cover the costs for Personal Protective Equipment (PPE), tools and equipment, wages, education and training and transport for the Enviro-Champs teams (DUCT, 2021).

Phase 1 outputs

Figure 4-5 Concrete butress weir built during phase 1 of Working for Wetlands construction cycle [source: GroundTruth, June 2019]

Phase 2, 2019/2020, included the construction of additional weirs (**Figure 4-6**). Following the completion of Phase 2, UMDM found that the impact of Phase 1 and 2 was already being felt upstream of Midmar Dam (at the inflow into the dam) and concluded that the benefits would multiply during the rainfall season. Water quality analysis at the time showed that the partially restored wetland had resulted "in a reduction of *E. coli* by approximately 86%". Water quality monitoring results also indicated that the wetland was reducing nutrient concentrations (nitrates and phosphorus) (documents provided by UUW, pers. comm. March 2024). However, it was suggested that this was likely an overestimate of the water quality outcomes given that only one site of water entering the wetland was being sampled at the time and water was likely entering the wetland through several other channels by-passing the monitoring site, resulting in greater concentrations of pollutants entering the wetland than what was being recorded.

Phase 2 Outputs

Figure 4-6 Construction of additional weirs in Phase 2 of the uMthinzima Wetland rehabilitation (WfW, 2024)

Phase 3 Outputs

Phase 3, 2020/21, included the construction of a final weir and a diversion channel (**Figure 4-7**).

Figure 4-7 Lateral diversion of water in the wetland (WfW, 2024)

The initial water quality monitoring analysis along the uMthinzima stream system from 2019 to September 2021 (Terry, pers. comm. November 2023), provides evidence of an improvement in the water quality of the uMthinzima Stream flowing into Midmar Dam, which was attributed to the ecosystem services provided by the uMthinzima wetland, which were enhanced by the restoration work. While based on concentrations rather than loads, the trends indicate that the wetland system has played an important role in reducing pollutants such as *E. coli,* phosphate, ammonia and nitrate linked to the uMthinzima Stream (pers. comm. July 2024) (see **Appendix 2**) which shows the marked difference in the *E. coli* levels of the uMthinzima Midmar inflow compared to the levels of the old Wastewater Works (WWW) pond outflow upstream of the wetland, and reductions in nutrient concentrations.

However, current data from an ongoing study led by GroundTruth, funded by Defra UK and supported by the Joint Nature Conservation Committee (JNCC) suggests that uncontrolled sustained heavy grazing of the uMthinzima wetland during and after implementation of EI interventions has

diminished the positive outcomes of the interventions and the capacity of the wetland to supply ecosystem services. Preliminary evidence suggests the following specific impacts: (1) grazing pressure in the area re-wetted by the interventions has favoured a non-palatable annual species (*Persicaria senegalensis*) and disadvantaged more palatable perennial hydric plant species, and this, in turn, is likely to have reduced habitat quality, long-term grazing value and the nutrient retention capacity in the wetland; and (2) large volumes of dung and urine are deposited by livestock directly in the wetland and its margins, contributing to elevated nutrient inputs and favouring E coli bacteria, which is probably further favoured by, each year, several cattle getting stuck, dying and decomposing in the wetland (Kotze, pers. comm. August 2024). It is worth noting that livestock (cattle) grazing was identified earlier in this section as one of the factors that have contributed heavily to the degradation of the wetland. One can assume that although this factor had been taken into consideration prior to wetland interventions being implemented, to date, minimal effort has been made to improve grazing practices in the wetland system.

Additional co-benefits of the rehabilitation, post the implementation of wetland interventions (2021-2023) have included:

- There has been a return of wetland specific bird species to the uMthinzima wetland, such as herons and egrets, which had moved away from the wetland due to its degraded state.
- The rehabilitation works created short-term employment for members of the local community, with a focus on disadvantaged women and youth. The planned employment was 25 local community members (15 women and 10 youth) for 12 months over a 2-year period (Challenge Fund Proposal, UMDM pers. comm, 2024).
- The uMthinzima wetland monitoring program has been pivotal in providing short-term employment opportunities, and capacity and development through wetland monitoring training for 32 citizen scientists (known as Enviro-Champs) in the Mpophomeni community (**Figure 4-8**). The program is currently (2024) in its second phase and is now being funded by UUW and managed by the South African Biodiversity Institute (SANBI).

Figure 4-8 Mpophomeni EnviroChamps attending the 'Wetlands Key Concepts' training course hosted by GroundTruth in 2022 (GroundTruth, 2024)

4.2.2 *Relevance of the returns (outcomes and outputs) to key role-players and funders/investors*

The water quality enhancement returns of the wetland rehabilitation are directly relevant to both UUW (bulk water service provider), the UMDM, indirectly relevant to the public (citizens and industries), and the local tourism sector and economy.

- Midmar Dam is a critical water provisioning resource and is one of the main water reservoirs of the UUW supply system and supplies the Midmar Water Treatment Plant with approximately 395 Mℓ/d. Therefore, it is critically important to UUW to protect the quality of this key resource as much as possible. This can attribute to reducing costs associated with water treatment (potable water supply), which would need to be passed on to the consumer (municipalities and the public). The uMthinzima Stream water quality enhancement/protection returns of the wetland and stream management and rehabilitation initiatives are, therefore, extremely relevant to the providers and users of potable water from the uMngeni supply system.
- Midmar Dam is also an important recreation and tourism asset and considered to have high recreational benefit to local and international visitors, through accommodation, day visits, birding, boating, and sports events including the well-known Midmar Mile swimming race. The economic impact of the 2019 Midmar Mile race was estimated to be in the region of R40 to 70 million (direct spend) and R80 to R142 million (in-direct spend) based on overnight

participants and spectators (TKZN, 2019). The overall recreation value of Midmar Dam was estimated to be in the region of R50 million per year (2017) in a study by Vundla et al., (2017) based using the travel costs of day and overnight visitors to the Dam as a proxy of value.

4.2.3 *Funding mechanisms applied and criteria for securing funding.*

[See also overview section on the origins of the initiative, Box 1]

4.2.3.1 *Funding mechanisms*

- For the Enviro-Champs and uMthinzima Stream Wetland rehabilitation (**Figure 4-1**) (downstream of the R617 road and upgraded WWTW, communal land) components, funding was pursued and secured primarily through written proposals to government administered programmes funded through public and donor funds (**Table 4-3**).
- The initial funding for the project was sourced through the Working for Wetlands (WfWet) programme, whose key objectives are employment creation and conservation of wetlands through wetland rehabilitation and maintenance initiatives. To secure funding through the WfWet programme, initiatives must meet these objectives. Accordingly, the rehabilitation strategy and plan were redesigned to include a more labour-intensive approach. The hard infrastructure component e.g. concrete buttress weirs, as required by the rehabilitation plan were not covered by WfWet funding. Recognising the common interest between the UMDM and UUW in protecting the water resources of Midmar Dam and the strategic role of the wetland, UUW agreed to assist by funding the materials for the hard infrastructure components.
    - The rehabilitation of the wetland located downstream of the WWTW on communal land (owned by Zenzele Community Trust), was estimated to cost approximately R5 million, including hard infrastructure (concrete weirs) and the use of machinery (initially) (**Figure 4-9**).
- For the rehabilitation of wetland areas associated with the upgrading of the Mpophomeni WWTW (**Figure 4-1** and **Figure 4-10**), funding was secured from the district municipality as part of the construction of the WWTW, as the wetland rehabilitation was a condition of the environmental authorisation. Funds were provided as part of the overall funding of the WWTW development.
    - The WWTW is being upgraded and will be operated by UUW.
    - The construction is funded through the organisation's Capital Expenditure (CAPEX) budget.
    - UUW have a contract with the UMDM to treat the effluent for the municipality. The contract is based on a 'Cost Plus' model, which means UUW will charge the municipality the cost of operating the treatment works and the CAPEX will be re-imbursed from a very small 'profit'. The contract will run for 20 years with an option to extend.

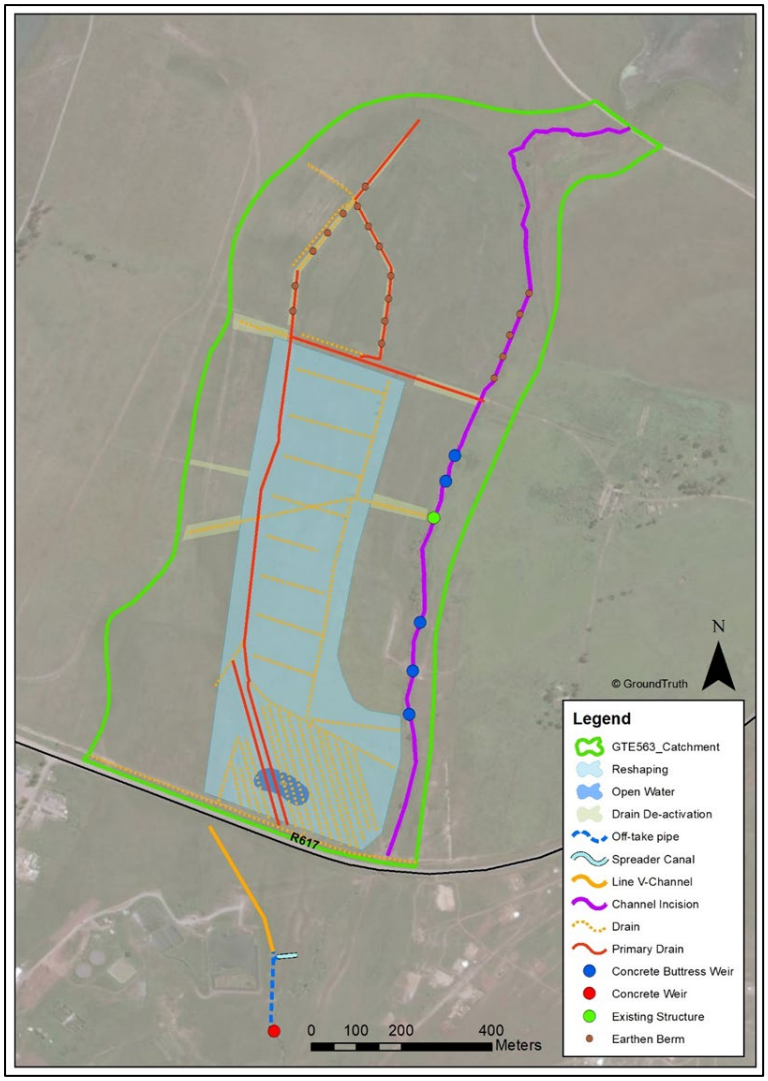

Figure 4-9 uMthinzima Stream Wetland rehabilitation (downstream of the R617 road and WWTW)

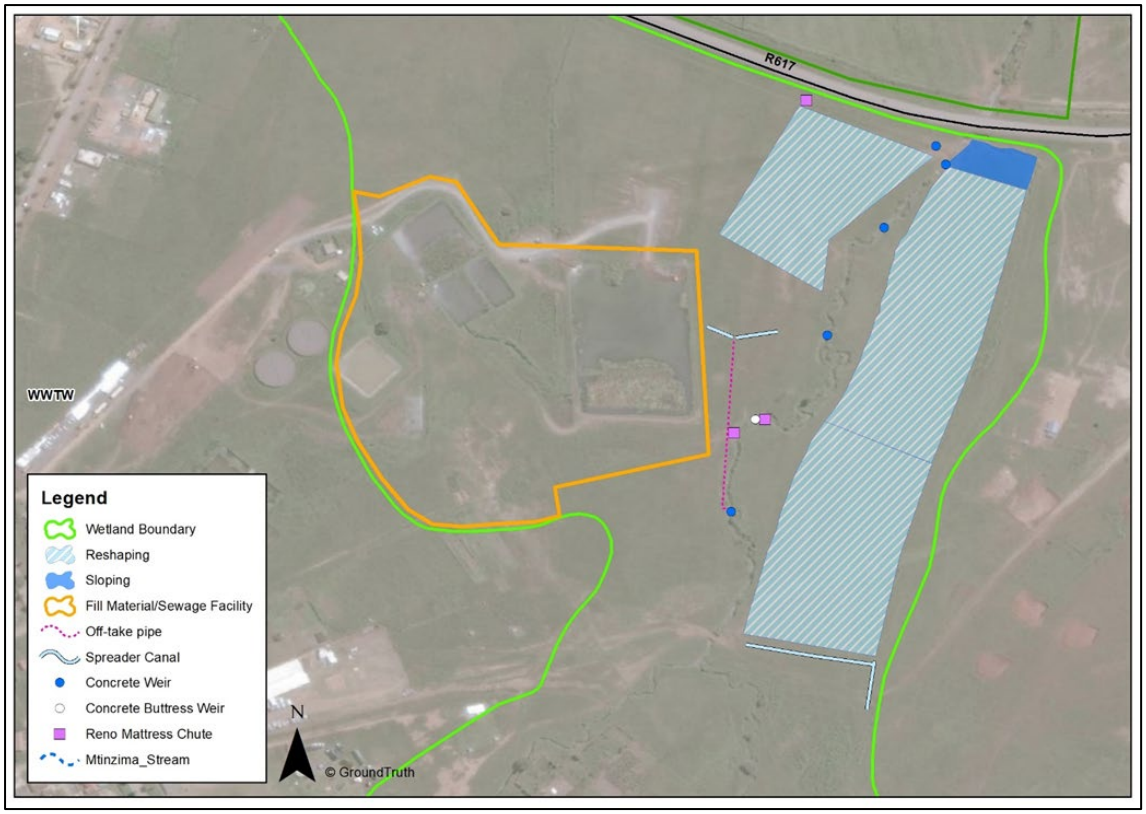

Figure 4-10 Mpophomeni WWTW wetland rehabilitation (upstream of the R617 road)

Proposals:

Several proposals and funding applications were undertaken to source funding or resources (time, labour and machinery) for different phases of the wetland rehabilitation project. These funding sources were obtained as donor grants and in-kind contributions, which have contributed to the implementation of hard and soft interventions, and wetland monitoring over the project life cycle. The proposals or funding applications that were explored are detailed below:

- **Regional Working for Wetlands (WfWet):** A proposal was submitted to the WfWet government led programme, which was unsuccessful due to concerns over landowner consent and expected project timeframes.
- **National NRM programme:** A proposal was then submitted to the NRM programme as part of the three-year project cycle. The proposal was successful and awarded in 2016. However, a condition of the funding was that the funds could not be used for the materials for the proposed hard infrastructure components of the rehabilitation nor for the use of machinery. The rehabilitation plan had to be adapted to the NRM implementation model of maximising labour intensity (work opportunities created), and training and capacity building had to be incorporated. R3.7 million (of the R5 million requested in the proposal) was awarded for labour (to be sourced from the local community), Personal Protective Equipment (PPE), and training and co-ordination over a three-year period. Eastern Wetland Rehabilitation, who were already an 'approved implementer' for the National NRM programme, were appointed as the implementers in collaboration with the local uMngeni Municipality and the District Municipality GEF 5.
- **SANBI Challenge Fund:** A proposal, including a 'project business plan' submitted to the fund was initially not successful. Subsequently, the SANBI Challenge Fund reconsidered the

proposal and agreed to partially contribute towards the rehabilitation, however the R1.1 million contribution could be used towards soft infrastructure and labour only. The funds would need to be administered through the Government NRM programme[5]

- **In-kind contributions:** Several specialists provided in-kind contributions, specifically for the development of the wetland rehabilitation plan and for soil and agricultural surveys of the wetland and surrounding area.
- **uMngeni-uThukela Water:** At this stage, the Mpophomeni WWTW development project, administered by uMngeni-uThukela Water, was approved. The UMDM co-ordinator of the wetland rehabilitation initiative approached UUW to consider providing the materials required for the hard infrastructure components of the rehabilitation. UUW agreed to pay a local supplier to provide the necessary materials. A cost-estimate of the materials had to be provided to UUW for approval prior to the materials being sourced from the supplier. UUW, at around this time, was increasingly recognising the link between catchment condition/management and water quality, which contributed to their willingness to support the wetland rehabilitation intervention.
- **Government Environmental Implementation Programme:** Two applications were made to a Government Environmental Implementation Programme, which included request for (1) funding the Enviro-Champs component, and (2) for funding the rehabilitation of the wetland. Neither of the proposals were successful.
- **Private sector:** Funding from the private sector was not specifically pursued for the wetland rehabilitation, as the public and donor sector funds secured (totalling R5.3 million) were adequate for the planned rehabilitation.

4.2.3.2 *Criteria*

Parts of the government funding obtained for the initiative came with specific conditions. Any funding from the NRM of the Department of Forestry, Fisheries and the Environment (DFFE) was intended to create employment opportunities, enhance restoration and maintenance of natural ecosystems, and develop the skills of employees. This was the case for the funding sourced through WfWet, a sub-component of the NRM programme, which required that a labour-intensive approach be applied, and that the project seek to address environmental challenges whilst prioritising skills development. In addition, these funding structures also targeted and prioritised the employment of women, youth and those previously disadvantaged. These requirements influenced how the rehabilitation works are planned and implemented. The funding prioritised labour-intensive approaches, and less priority was placed on hard interventions that required more technical expertise and heavy machinery. A benefit of implementing through the NRM programme was avoiding the need for an Environmental Impact Assessment (EIA) and water use licence application, which would have added significant costs and time**.** This is particularly important as these studies are expensive and institutional arrangements (such

[5] There would have been a challenge in transferring GEF funds from SANBI to the municipality. Directing the funds through the National Department and the NRM programme (the DFFE-NRM-SANBI link) made it easier to secure funds from the Challenge Fund for the Municipality (UMDM) led initiative. The Challenge Fund was created specifically as a means of 'using' the GEF 5 BLU funds. The GEF 5 funds were not secured specifically for the Mthinzima-Mpophomeni EI investment, but for the broader BLU project, which later 'selected' the Mthinzima-Mpophomeni system as one of the UEIP demonstration sites.

as the general EIA or WULA licence granted to WfWet), which reduce such costs can promote investment. The NRM WfWet programme had already secured an Environmental Authorisation and Water Use Licence covering several wetlands in the catchment including the uMthinzima wetland.

The Mpophomeni Enviro-Champs initiative (from the MSEP to the AEN programme) were primarily supported through government funding, with requirements primarily focusing on:

- High impact – providing quantifiable evidence of project impact by reporting on project outcomes. Examples included the number of hectares of IAPs cleared, number of dumpsites monitored, or number of manholes that have been reported are fixed) (**Figure 4-9**).
- The government funding requirements included a strong labour-intensive approach, in which person days were reported on; to demonstrate the impact the programme was having in terms of "job creation".
- The funding had a strong green skills development component, which included provision of training opportunities, such as wetland monitoring or citizen science training.

Figure 4-11 One of the Mpohpomeni Enviro-Champs pointing at one of the leaking sewer manhoes in the Mpophomeni area in 2012 (MSEP, 2013)

The AEN programme, experimented with using a blended finance approach, which involved a range of partnerships across private and public sector institutions. This blended approach had multiple conditions which dictated how the funding was allocated:

- Private or public sector organisations had to provide a co-funding amount of R45 000 in support of the funding from DSI. The DSI funding was used to support the ten (10) groups of Enviro-Champs through wages, tools and equipment, protective clothing, consumables,

training, and transport. The co-funding was used to support the Enviro-Champs through data and communication (via phone calls or social media platforms), and a large portion of the administration for each Enviro-Champs group. DUCT was responsible for the administration and managed all project procedures and finance.

Table 4-3 Summary of funding sources for the uMthinzima Stream rehabilitation and water quality improvement initiative over its 2011 - 2024 period thus far

Aspect/Activity	Funding Source	Time period	Value/Amount (Rands)	Value/Amount (% total)
Mpophomeni WWTW wetland rehabilitation				
All components	uMngeni-uThukela Water, CAPEX budget for construction of the WWTW.	In progress	Not distinguishable from the overall budget for construction of the WWTW, which was estimated at R389 million (2019).	Not distinguishable from the overall budget for the construction of the WWTW.
uMthinzima Stream Wetland rehabilitation				
Labour, PPE, training, co-ordination	Public funds (government NRM programme).	3-year period	R 3.7 million	74% of estimated cost.
Labour, soft rehabilitation interventions	Donor funds (GEF, administered by SANBI, directed through the NRM programme).	3-year period (through/with the NRM funds)	R 1.1 million	22% of estimated cost.
Hard infrastructure materials	uMngeni-uThukela Water).	3-year period	R569 505 (ex. VAT)	11% of estimated cost.
		TOTAL	R5.37 million	107% of estimated cost.
Enviro-Champs				
Data, airtime, management fees, marketing and monitoring and evaluation	Public funds (District Govt, UMDM) Donor funds (NPO DUCT through PES /WESSA) SANBI.	2-year period through DSI funding and co-funding[6]	AEN Phase 1: R100 million. AEN Phase 2: R5.82 million	2.3% of the total budgeted. Funding was obtained from DSI and was held through the AEN Programme.
Co-ordination/management	Phase 1 of monitoring: DUCT Phase 2 of monitoring: SANBI.	Phase 2: October 2021 to November 2022	R1.53 million	9.6% of the total budgeted funding was allocated coordination/ management.
In-kind / pro-bono contributions				

[6] The co-funding budget for the AEN programme was used to cover mobile data, management fees, marketing and monitoring and evaluation of the project.

Aspect/Activity	Funding Source	Time period	Value/Amount (Rands)	Value/Amount (% total)
Overall co-ordination	UMDM - (KZN Department of Economic Development, Tourism and Environmental Affairs) (Govt.)	3-year period	Pro Bono – project coordinator (KZN Department of Economic Development, Tourism and Environmental Affairs)	
Planning (Development of wetland rehabilitation plan)	GroundTruth (Pvt)	2014-2015	Pro Bono	
Land Capability Study (soil and agricultural surveys)	KZN Department of Agriculture and Rural Development (DARD) (Provincial Govt.)	2015	Pro Bono	
Enviro-Champs co-ordination	DUCT/WESSA	3-year period	Not distinguishable from the overall budget provided by UMDM.	

4.2.4 *Business case for investment in water-related EI*

A narrative business case was developed for the initiative and used in the various project proposal submissions. The business case was built primarily around the role that freshwater ecosystems can contribute towards improving water quality. Ultimately, the wetland rehabilitation and Enviro-Champs initiatives would contribute towards the protection of the strategically important Midmar Dam water resource, thereby reducing the risks of contamination of the resource and avoiding/reducing the likelihood of higher operational management and potable water treatment costs in future.

The ecosystem service assessments of the wetland areas indicated that post-rehabilitation the areas of wetland habitat would potentially supply water quality enhancement related services at an Intermediate to High level.

The business case was further supported by highlighting the following additional benefits:

- Maintaining the tourism sector associated with the dam, such as the Midmar Mile event, which is regarded as the biggest open water swimming competitions in the world. The overall recreation value of Midmar Dam was estimated to be in the region of R50 million per year (2017) in a study by Vundla et al., (2017). While certainly a case for private sector benefit (local tourism businesses) and therefor investment, private sector funding for the wetland rehabilitation was not specifically pursued in this case.
- Temporary work opportunities for local community members as part of the wetland rehabilitation activities (these were targeted toward disadvantaged women and youth).
- Training (recognised/accredited training) and skills development, and stipends/payments for local community members such as the Enviro-Champs undertaking wetland monitoring and maintenance activities, including skills beyond wetland related activities such as basic plumbing skills.

- Serving as a benchmark in integrating the protection of EI with sustainable service provision/infrastructure.

The business case further showed that the project was responsive to national, provincial and local development and conservation priorities, specifically (Office of the Premier, 2014):

- Complementing and supporting the development of the upgraded WWTW for the Mpophomeni settlement (national priority to provide comprehensive sanitation services) and promoting the sustainable supply of water for the broader community.
- Aligning with national development priorities by seeking to address pressures on biodiversity and ecosystem services particularly related to the water sector and supporting Priority 2[7] of the National Strategy for Sustainable Development 'Sustaining our Ecosystems and using Natural Resources Efficiently' (DFFE, 2014).
- Aligning with the National Water Resources Strategy by protecting, conserving, managing and controlling water resources in a sustainable and equitable manner.
- Supporting Strategic Objective 5.3 of the KwaZulu-Natal Provincial Growth and Development Plan which is to 'manage pressures on biodiversity within all growth and development activities'.
- Aligning with the uMgungundlovu District Municipality Strategic Environmental Assessment (SEA) and specifically responsive to the sustainability criteria and strategies of the SEA including 1) rehabilitation projects that create green jobs and restore land and natural resources; 2) the protection and enhancement of land identified as essential for the persistence of biodiversity and the provision of ecosystem services, and 3) that degraded areas are identified, rehabilitated and managed to promote land productivity.
- Contributing to protecting the condition of freshwater ecosystems classified as National Freshwater Ecosystem Priority Areas (NFEPAs).

4.2.5 *Extent to which EI investment contributes to social justice*

Contribution to building the skills, qualifications and work experience of local community members such as the Enviro-Champs. Ward (2016:37) highlights "the Enviro-Champs initiative is building the capacity of school going youth and out of work community members in ways that will enhance not only their employability but also contribute to the management of our ecological infrastructure in South Africa". In addition, the project has been able to provide training for the UUW Young Water Professionals (YWPs), to facilitate the co-development of a monitoring plan for the uMthinzima Wetland (**Figure 4-10**). This training was aimed at equipping the YWPs with the skills to be able to independently develop monitoring plans applicable to wetlands in other areas and allow them to provide training to EnviroChamp groups that are responsible for the monitoring of these wetlands. This is intended to support the ongoing monitoring of the uMthinzima wetland.

[7] Priority 2 refers to the second strategic objective within the National Strategy for Sustainable Development (NSSD) which is aimed at encouraging citizens to conserve and responsibly manage natural resources such as water. One of objective of this priority is the increase of "blue beaches" to over 29 which is awarded to beaches that comply with environmental regulations related to environmental stewardship (DFFE, 2014).

Figure 4-12 UUW YWPs doing fieldwork as part of their wetland monitoring training hosted by GroundTruth in 2023 (GroundTruth, 2024)

- Empowering local community members, as Enviro-Champs, to communicate confidently and effectively with government officials at both the local and wider level. As stated by Ward (2016:35): "This is an important component of the work of the Enviro-Champs and has in some ways been a distinguishing feature of this project. In a country where demonstrations only seem to receive attention when they turn violent, the collaborative and supportive orientation underpinning this project has been remarkable".
- Temporary work opportunities were created for local community members during the implementation of the rehabilitation activities, targeted towards disadvantaged women and youth. Despite the short-term employment provided by the rehabilitation, community members were able to use the stipends received to support their families or for personal development (e.g. doing a course).
- The project co-ordinator feels that a community benefit link is still missing, however more recent growth and development in the Enviro-Champs component is expected to increase community benefits. Additional options could include providing community access to Midmar Dam (for recreational activities including inter alia, such as boating, canoeing, fishing, and water sports) and supporting improved grazing practices and livestock management (e.g. through training, introduction of improved practices, employing local herders (ideally through a funded project focused on monitoring and evaluation) to improve livestock condition while reducing pressure on the local wetland systems. However, there are governance and land-ownership issues related to livestock grazing in the broader area, which will need to be taken into consideration.

4.2.6 *Key lessons were learnt from initiatives in the uMthinzima Wetland*

Enablers:

- Establishment of the UEIP and the associated collaborations and objectives to identify and support three demonstration sites.
- Existing environmental authorisation and Water Use Licence (WUL) for the downstream wetland rehabilitation through the national NRM programme, which would otherwise have added significant costs to the initiative.
- Securing the NRM funds facilitated access to the SANBI Challenge Fund.
- Rehabilitation of the upstream wetland being a condition of the environmental authorisation for the WWTW, which contributed to motivating uMngeni-uThukela Water's support of the downstream wetland rehabilitation. The rehabilitation plans for the various wetlands were integrated and complimentary.
- Landowner consent – the NRM WfWet programme had not prioritised the wetland for rehabilitation due to concerns over obtaining landowner consent from a tribal/communal land trust. The UMDM co-ordinator made sure to engage the landowners and community directly and to obtain various assessments and information (e.g. the agricultural land potential survey) and present these to the landowners for consideration.
    - Existing relationships between the UMDM (District Municipality) and the landowners further facilitated the engagements.
    - Community support was also forthcoming/encouraged through the existing NGO initiatives around water quality and environmental education.
- In-kind/pro-bono contributions from GroundTruth played an important role in developing the initial rehabilitation plan for the wetland systems. The GroundTruth team also provided support through coordinating the wetland rehabilitation and providing specialist input through the development and signing-off of the implementation plan for the first phase of interventions. Soil and agricultural surveys of the wetland and surrounding areas were also provided as an in-kind contribution by the KZN Department of Agriculture and Rural Development.

Challenges:

- Securing long-term funding for the implementation of the hard infrastructure and ongoing maintenance and monitoring of the wetland before, during and after the rehabilitation activities.
- The rehabilitation plan was initially designed to have a larger earth works component, however some of these elements were adapted to suit a more-labour intensive approach to align with the funding criterion of different funders. For example, the WfWet funding, adapted the rehabilitation plan to include a labour-based approach, as the criteria of the funding at the time had to have an employment creation component (socio-economic benefit). As the project progressed, there were aspects of the rehabilitation plan that were envisaged and not implemented, particularly the earth works (engineered structures). Although UUW provided resources to implement the hard interventions, the cost associated with this were significant.
- The continuity (and dedication) of the people involved was an influential factor in initiating, planning, funding, and scaling of the initiative. Once the 'champion' leaves, a new relationship has to be established, with the 'new person' now holding decision making power. It takes time

to build trust, thus this could take longer than anticipated, and influence the continuing, funding or scaling an initiative.

- Lack of water quality data depicting the state of water quality before and after the implementation of the rehabilitation activities. For similar wetland rehabilitation projects, this should be addressed through building a comprehensive dataset of water quality (in this instance, linked to wetland rehabilitation). This can be achieved through developing an intensive and well-planned monitoring plan by selecting appropriate monitoring sites and collecting relevant data e.g. flow monitoring and water quality samples. Ideally, baseline data should be collected prior to the implementation of the rehabilitation activities to ascertain the impact of the EI on the receiving environment. This data should be collected consistently over time, to avoid data gaps, and subsequently inaccurate assumptions deduced from the data analysis.

Key lessons:

Develop a business case demonstrating the socio-economic outcomes of the EI intervention:

- Data collected by the Enviro-Champs within the wetland monitoring programme can be used to build a business case to attract more funding for other components of the rehabilitation plan which have not been implemented to date. Specifically, water quality data (showing the improvement of water quality due to the functioning of the wetland) can be translated into monetary value which is valuable to the private sector.

Pursue and plan for multiple sources of funds over different timeframes:

- Desired funds may not all be secured prior to starting implementation, and thus an incremental and/or phased approach must be considered.
- Funds for different aspects of the intervention (e.g. hard/soft infrastructure, monitoring, capacity building, co-ordination) may need to be sought from different funders.

Allow for flexibility in the intervention design/plan and implementation:

- Be prepared to adapt the approach to accommodate the funder's requirements.

Look for opportunities to make and/or highlight links between grey infrastructure and EI:

- Reducing the risk to the water quality of the Midmar Dam (major regional water supply dam) was a driving motivational factor across the components of the initiative, which was communicated explicitly in the various proposals.
- The rehabilitation plan for the downstream wetland was integrated with, and complimentary to, the overall design and wetland rehabilitation of the upgraded WWTW.

5. UMHLANGANE INITIATIVE

5.1 Background

The uMhlangane catchment is in a highly urbanised and densely populated area in the eThekwini Municipality of KwaZulu-Natal. **Figure 5-1** below shows the location of the Riverhorse Valley Wetland and some of the riverine interventions in the uMhlangane catchment. It is characterised by a diverse land-use context, incorporating commercial, residential, industrial, and open space. Land ownership is also diverse and includes state (under iNgonyama Trust), municipal, and private land ownership. The uMhlangane Catchment is a highly transformed and polluted system, which has a significant impact on water quality and ecosystem functioning. Degradation of aquatic ecosystems is compromising key ecosystem service(s) including streamflow regulation, flood attenuation, water quality maintenance, and biodiversity habitat provision. Investment in EI management and restoration in the uMhlangane Catchment was first initiated at the Riverhorse Valley Wetland. The Riverhorse Valley Wetland spans both the east and west sides of the current N2 national highway. The area and landscape have changed dramatically since the early 1800s when the area was part of a large lake in which hippopotami were common. By the 1930s only a small remnant of the former extensive lake remained, the remainder having been drained and used for sugarcane cultivation. In the late 1960s the last of the swamp was converted into a series of large oxidization ponds that formed part of the WWTW of Durban. In the early 1970s the N2 national highway was built through a portion of the lake, and its outlet into the Umgeni River was canalized.

In the early 1990s the potential to develop the Riverhorse Valley floodplain as a business estate was recognised, which led to the establishment of the Riverhorse Valley Management Association in 2003 and the start of construction of the business estate in late 2004 (**Figure 5-2**). The Riverhorse Valley Business Estate Management Association (RHVBEMA) was set up to manage the public space in the Riverhorse Valley Business Estate, with the purpose of creating, enhancing, and protecting the value of property ownership and occupation within the estate. This mandate included regulating the environment, with particular focus on safeguarding and environmental management. Management of the Riverhorse Valley Wetland was a focus largely due to its critical ecosystem services associated with flooding risk mitigation. The management of the Riverhorse Valley Wetland by RHVBEMA is still ongoing, through cooperative rehabilitation and management of the freshwater ecosystem involving the investment by the public and private sector, civil society organisations/businesses (**Figure 5-3**).

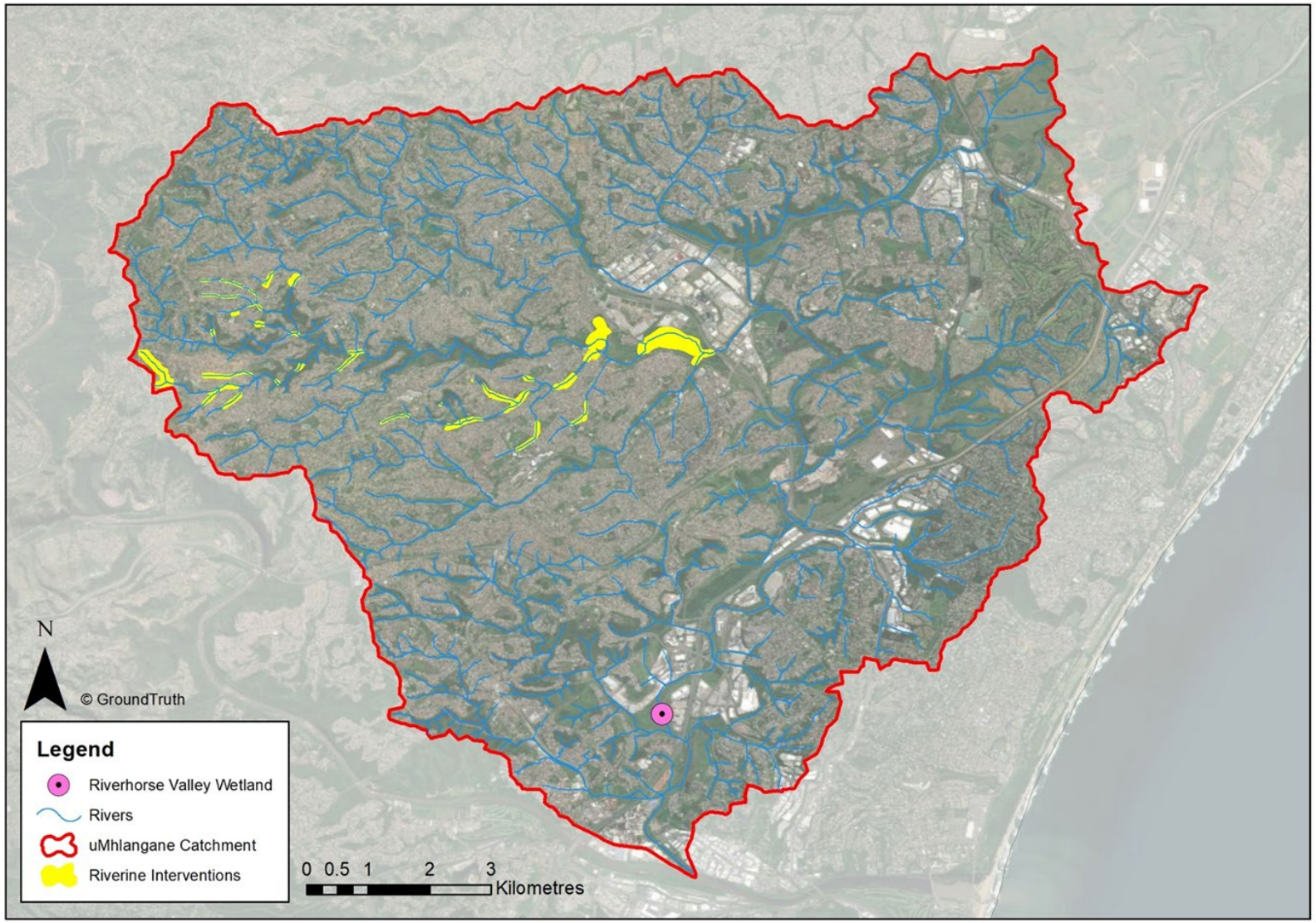

Figure 5-1 Overview of the uMhlangane catchment including some of the riverine interventions locations, and the Riverhorse Valley Wetland

Figure 5-2 Riverhorse Valley Wetland and Business Estate located in the uMhlangane Catchment (Source: Riverhorse Valley Business Estate (RHVBEMA), 28 September 2020)

In 2010, the cities of Bremen (Germany) and Durban (eThekwini Municipality) jointly established a municipal development partnership for climate change mitigation and sustainable natural resource management. In 2011, the two cities joined the pilot phase of the Service Agency project '50 Municipal Climate Partnerships by 2015'. Through this project, Bremen and Durban drew up a joint programme of action that included activities for climate change mitigation and adaptation, and the resources needed to implement the measures. Based on these joint plans, in 2012 the partnership successfully applied for funding from the Service Agency's Programme to Support Municipal Climate Change Mitigation and Adaptation Projects (FKKP). The proposed project 'wetland rehabilitation in the uMhlangane River catchment to adapt to climate change' received support of €500 000 under the FKKP, provided from special funds of the German Federal Ministry for Economic Cooperation and Development (BMZ). The project was initiated in 2016 and focused on protecting and restoring Riverhorse Valley Wetland ecosystems in the uMhlangane River Catchment in northern Durban. The measures were designed to mitigate the negative impacts of climate change, such as flooding and water pollution. The project also aimed to make a direct contribution towards improving the living conditions of the local communities.

Figure 5-3 Cooperative rehabilitation and management of the Riverhorse Valley Wetland involving investment by the public and private sector (Source: Riverhorse Valley Business Estate Management Association, 13 June 2018)

In 2010, the Green Corridors Green Spaces project was initiated in the uMhlangane Catchment. The project was led by the Green Corridors non-profit company (NPC), a city-supported special purpose vehicle working on community upliftment through the creation of a green spatial economy. Green Corridors facilitated partnerships between municipality and other river management stakeholders with the objective to enhance local quality of life, living environments, and sustainable livelihoods. A three-year funding agreement was secured with eThekwini Municipality (ongoing subject to annual renewal of the Memorandum of Agreement), in addition to other externally funded projects. A community partnership approach was applied, with local communities employed to maintain, improve and create new riverine open spaces. Support was provided to enhance sustainable livelihoods through upcycling/recycling waste collected from rivers, and growing food crops on the banks of restored streams (**Figure 5-4**), developing nature-based and community-based tourism, and youth projects.

Figure 5-4 Local communities are growing vegetables along stream banks that are being restored and managed through the Sihlanzimvelo Programme (Source: Tony Carnie/Daily Maverick, 12 July 2022)

The eThekwini Engineering Department (Coastal Stormwater and Catchment Management Unit) recognised that most local watercourses in the eThekwini Municipality were severely degraded/impacted, and that there was a lack of coordination between various municipal departments in resolving these issues. Most watercourses were clogged with IAPs and heavily polluted with litter/waste. This contributed to stormwater blockages and pollution downstream of highly populated areas posing as health and safety hazards for inhabitants. In 2009, the eThekwini Roads and Stormwater Maintenance Department initiated the Sihlanzimvelo Programme in collaboration with various line departments within the city. The programme aimed at ensuring that all watercourses were brought up to an appropriate standard to reduce stormwater blockages and pollution downstream of these high-density areas. This programme was then aligned to address the eThekwini Municipalities objective of creating work opportunities, experience and skills for local contractors and communities within the wards of the streams being targeted. The initial Sihlanzimvelo Project, due to budget constraints, only focussed in the Inanda, Ntuzuma, Kwamashu (within the uMhlangane Catchment and including the Riverhorse Valley Wetland), and Umlazi areas. There are approximately 800 km of rivers, streams, and open storm water channels within the target areas. Various departments, ward councillors and ward committees within the municipality were consulted and assisted in identifying the worst affected watercourses according to their condition and the impact these had on the surrounding communities within the identified areas. The streams located in high-density, low-income settlements where poor river quality is associated with human health risks and flooding impacts are being prioritised. Community co-operatives are employed and trained to clean stream banks and culverts of litter/waste and invasive plant species across the target catchments (**Figure 5-5**). This resulted in 100 km of the stream network being selected in the Umlazi area, and 300 km in the Inanda, Ntuzuma and Kwamashu (INK area). Each of the co-operatives, which were operated

by local community members and organisations, was allocated 5 km of stream that they had to clean/clear and maintain. Qualifying community co-operatives were selected and trained to be part of the programme to support the goal of maximising employment opportunities for community members that reside within the local area. Each co-operative had between 5 and 8 members, were contracted for a 36-month period to perform tasks (**Figure 5-6**) (**Table 5-1**),and paid at a pre-determined rate on tasks completed for the month. A consultant was employed by the municipality to manage the project, including appointing community assessors to monitor implementation and build local awareness. By 2019 it had succeeded in improving the ecological environment of targeted streams as well as creating approximately 640 work opportunities at a local level, with 80 co-operatives maintaining 400 km of streams.

Table 5-1 Scope of work for each co-operative

Scope of Contract	
Natural streams – debris	Remove all rubble and refuse blocking the free flow of the stream and disposed of it at a designated municipal disposal site. The stream is to be kept clear of all debris for the duration of the contract.
Natural streams – alien vegetation removal	Invasive and alien vegetation to be removed and disposed of at a designated municipal disposal site. The project area is to be kept clear of all IAPs for the duration of the contract.
Natural streams - erosion protection	Stream bed and stream banks are to be protected against erosion by constructing and maintaining erosion bolsters as per the municipality's standards. Minor scour areas must be backfilled with rock and compacted. Rocks can be collected from the surrounding area or are to be supplied by the Roads and Stormwater Maintenance Unit.
Grass and vegetation maintenance	All grass and vegetation must be cut and kept to a maximum height of 150 mm. Width from either side of stream edge must be defined but should not be less than 3 m. Cuttings must be disposed of at a designated municipal disposal site.
Litter control	Emptying of bins and picking up of litter, refuse and debris found in the stream is to be disposed of at a designated municipal refuse disposal site. The project area is to be kept clear of all litter for the duration of the contract.

Figure 5-5 Clearing of litter and invasive alien plans through the eThekwini's TRMP (Source: Green Corridors)

Figure 5-6 Community cooperatives contracted to clear and maintain 5km stretches along streams in the uMhlangane catchment (Source: eThekwini TRMP)

While the Sihlanzimvelo Project was largely successful, deteriorating river water quality and more frequent flooding caused escalating costs to the city, businesses, and residents of Durban. eThekwini Municipality established a strong policy base and institutional buy-in for riverine management,

especially in partnership with other stakeholders, which resulted in the establishment of the eThekwini Transformative River Management Programme (TRMP). The TRMP is nested in the Durban Climate Change Strategy and its Climate Action Plan as a C40 City. The TRMP aims to adapt the 7 400 km of streams and rivers across multiple catchments, including the uMhlangane, to the flooding, drought and higher temperatures that can be expected from climate change. Ultimately the TRMP aims to develop the social and economic capital of the city and change the way the city looks at rivers and streams, by treating freshwater ecosystems as a socio-economic asset, and change community lives, urban spaces, and reconnect people and communities with water.

The torrential floods in 2022 (**Figure 5-7**) caused massive damage and loss of life, which inadvertently supported the promotion of the TRMP to industry and residents. About 80 percent of blockages that led to massive infrastructural damage were caused by IAPs. A smaller portion of the damage was attributed to build-ups of solid waste such as plastics. Historically, culverts were designed using hydraulic capacity calculations and did not factor in the debris carried by rivers during storm events. Areas managed under the Sihlanzimvelo Stream Cleaning Programme experienced much less damage during these floods.

Figure 5-7 Damage to infrastructure and to services adjacent to Caversham Culvert (Durban) during 2022 floods due to blockages being caused by alien vegetation and solid waste (Source: Geoff Tooley, eThekwini Municipality)

TRMP comprises a wide range of stakeholders, including private business (e.g. Bridge City Management Association), NGOs (e.g. Green Corridors, DUCT, Adopt-a-River), civil society organisations (e.g. Safe Cities, Ntuzuma Conservancy), local authorities (e.g. eThekwini municipalities Coastal Stormwater and Catchment Management), and local communities (e.g. Mpande Youth Empowerment Organisation, Clean My Community Forum, INK Enviro Org). These stakeholder groups, in addition to funders and investment corporations/development financing organisations (e.g. C40 Cities Finance Facility (CFF), AFD, GIZ, State Secretariat for Economic Affairs Economic Cooperation

and Development (SECO), World Bank, International Finance Corporation, Development Bank of South Africa (DBSA), and Dutch IFI Investment International) make up the critical role players.

eThekwini's partnership with C40 CFF, which started in 2018, helped to highlight the Sihlamzimvelo Programme and TRMP, which helped to generate support from key decision makers. This translated into support from senior management to increase the budget for the program and its impact on the ground. Employees of the municipality have also been exposed to different thought processes and ideas, which has allowed the growth as a collective and transition away from old narrow silo focused thinking. C40 CFF has also supported the appointment of a Senior Project Advisor who facilitated the capturing of the knowledge and learnings to support a paradigm shift across South Africa and potentially internationally as well.

In 2020, C40 CFF commissioned a vulnerability assessment to inform climate change scenarios and a cost- benefit analysis (CBA) to support the development of a business case for upscaling investment in Durban's TRMP across several catchments, including the uMhlangane. The C40 CFF supported TRMP for four years with R 8 billion. The business case and cost- benefit analysis that had been undertaken illustrated how using a similar model to manage the entire 7'400 km of rivers and streams within the city's boundaries could assist the city in future.

In 2022, the Cities and Climate in Africa (CICLIA), a project preparation facility co-funded by the European Union, the Swiss State Secretariat for Economic Affairs (SECO) and managed by Agence Française de Développement (AFD), started providing financial support for the eThekwini Municipality for Durban's TRMP. This involved identifying partnerships and role players within three spaces (one of which was the uMhlangane River catchment) and to develop on the ground implementation plans that will serve as a blueprint for businesses and property owners to fund co-operatives to clear rivers and streams on privately owned and tribal trust land.

Table 5-2 summarises the key financial investments made in EI management and restoration in the Riverhorse Valley wetland, and the Sihlanzimvelo/TRMP programmes to date.

Table 5-2 Role-players involved at different phases of the EI investment in the uMhlangane catchment

Initiative	Planning	Funding	Implementation
Riverhorse Valley Wetland management	• Bremen city (Germany) and eThekwini Municipality Environmental Planning Climate Protection. Department (South Africa) • Riverhorse Valley Business Estate Management Association.	• German Federal Ministry for Economic Cooperation and Development (BMZ) (donor). • Public sector investment by the eThekwini Municipality. • Investment by the private sector, civil society organisations/businesses (through the Riverhorse Valley Business Estate Management Association).	• eThekwini Municipality. • Green Corridors Non-Profit. • Riverhorse Valley Business Management Association's service providers.
Transformative Riverine	• The C40 CFF. • French Development Agency (AFD).	• C40 CFF. • GIZ/German Federal Ministry for Economic	• eThekwini Municipality - Environmental Planning Climate Protection

Initiative	Planning	Funding	Implementation
Management Programme	• eThekwini Municipality (local government).	Cooperation and Development (BMZ). • Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). • CICLIA (EU and SECO, managed by AFD). • eThekwini Municipality (public sector).	Department and Coastal Stormwater and Catchment Management Department (government). • Private sector service providers (e.g. GroundTruth, Eco-Pulse, REAL Consulting). • NGOs and civil society organisations (e.g. Green Corridors, Ntuzuma Conservancy, DUCT, Adopt-a-River, Litter-Boom Project).

5.2 Insights and lessons from stakeholders

Key lessons and experiences on financing of EI management and restoration highlighted by stakeholders in the uMhlangane catchment are summarised below.

5.2.1 *Ecosystem service returns (outputs and outcomes) from EI interventions*

Investment in EI restoration and management in the uMhlangane Catchment has contributed to the improvement of the ecosystem services and functioning along the uMhlangane River system, the health and well-being of local communities, and strengthened the resilience of the natural infrastructure in this catchment. Examples of the key outputs and outcomes of the investment include:

a) Riverhorse Valley wetland:

- Improved physical condition and aesthetics of the wetland system.
- Employment of community members to remove alien plants, and plant indigenous plants within the wetland.
    - Planting over 100 indigenous trees on the periphery of the wetland (including *Calpunia aurea, Syzigium cordatum* and *Bridelia micranta*).
    - 41.5 hectares of alien plant species and tons of refuse were removed from the wetland habitat.
- Employment of more than 800 community members to remove alien vegetation from tributaries associated with the wetland.
    - Removal of IAPs in 54 hectares of riverine area upstream of the wetland.
- Improved ecological functioning of the wetland and associated freshwater ecosystems, thereby reducing the risk of flooding through improved flood attenuation.
- Decreased erosion in the wetland area and improved wetland services.
- Socio-economic empowerment of local communities, and increased income and wellbeing of community members through employment opportunities.
- Establishment of sustainable ecosystem management practices (such as IAPs clearing and replanting of indigenous riparian tree species).

- Establishment of a continuous water-quality and flow monitoring station downstream of the rehabilitated wetland.

b) Transformative Riverine Management Programme:

- Improved condition and management of riverine ecosystems in the catchment through the clearing of IAPs, planting of indigenous tree species, and stabilising natural infrastructure (e.g. erosion control measures on stream/riverbanks).
- Socio-economic empowerment of local communities, through jobs and income earning opportunities.
- Improved functionality and resilience of river ecosystems to urban impacts and climate change.
- Improvement of the condition and management of the built landscape adjacent to the rivers due to the minimisation of accelerated stormwater, sediment, and pollution loads (e.g. through re-establishment of natural vegetation, removal of IAPs, and removal of litter).
- Decreased climate change vulnerability and impacts of flooding on communities, households, natural- and built-infrastructure, and economic development of the city.
- Community upliftment and empowerment through employment and capacity building opportunities.
- Enhancing social well-being through improvements to areas of spiritual and recreational value e.g. fishing, walking, relaxing, socialising along the river.
- Sewer leaks being reported and fixed more efficiently contributing to improved water quality.
- Cost avoidance/saving for repairs to damaged municipal road infrastructure and crossings.
- The long-term investments in EI conservation or rehabilitation have many additional benefits compared to traditional engineering solutions. Some of these are:
    - Improved habitat, water quality, security.
    - Better protection of grey infrastructure.
    - Advocacy role established in those involved.
- Community upliftment and local economy stimulation.
    - Development of cyclical processes which create further economic opportunities.
    - Increased resilience of cities and their communities.

5.2.2 *Relevance of the returns (outcomes and outputs) to key role-players and funders/investors*

a) Riverhorse Valley wetland:

- The wetland rehabilitation demonstrated the value of restoring EI as part of the municipal stormwater system, particularly in the context of escalating climate change related flooding. From a municipal perspective, EI restoration requires both capital and operational funding, which can be difficult to raise within the boundaries of municipal financial policy because EI is not usually reflected in the municipal asset register. The Riverhorse Valley Wetland project helped to highlight this problem and to demonstrate the case for functional ecosystems to be recognised in municipal accounting systems as critical infrastructure in need of adequate capital funding and ongoing maintenance. This also highlighted the need to address problems associated with unlocking capital for major EI projects through loans. The Riverhorse Valley Wetland project highlighted that co-investment/financing can be leveraged when there is

shared recognition between the municipality and private sector actors of the value of EI. The common value was founded on mutual recognition of the importance of an ecosystem-based adaptation approach involving wetland restoration and river management, to contribute to a reduction of flood risk and improving water quality in the area. As a result, wetland restoration and long-term management was funded and implemented in partnership with several organisations. This collective action has contributed to the long-term sustainability of the efforts and project activities. The Bridge City Management Association represents several of the key private sector stakeholders in the proximity of the wetlands, and who are affected by flooding and the functioning of the wetland. The long-term active participation of the Bridge City Management Association is testament to the private sector recognition of the benefits and returns from their investment. The ongoing commitment and investment by eThekwini Municipality, and the expansion of the TRMP is evident of recognition of the meaningful returns on investment to the public sector. Similarly, the recognition of the socio-economic returns is evidence by the growing commitment by NGOs, civil society organisations, and community groups.

- Private sector looks for and recognises long-term benefits of EI investments, not just for the environment but for their business operations and societal welfare, plus ensuring the precinct remains a place to invest. These benefits include:
    - Mitigating the risks associated with climate change, such as flooding and declining water security.
    - Compliance with environmental regulations and policies can motivate investments in EI to avoid penalties.
    - Enhancing brand image and meeting stakeholder expectations.
    - Businesses might invest directly in EI as part of their Corporate Social Responsibility (CSR) initiatives or operational sustainability strategies.
- Conversely, deterrents for private sector investment in EI include:
    - Significant requirements for upfront investment required for EI projects.
    - Lack of understanding of the benefits in investing in EI and a lack of understanding of the potential environmental implications of not.

b) Transformative Riverine Management Programme

- eThekwini Municipality's plan to provide sustainable water services and protection from flooding included within the city's climate action plan, promotes nature-based solutions and the protection of the City's EI. The TRMP is a key part of its delivery and since 2010, it has implemented several EI management and restoration projects. These projects have also become a mechanism for addressing several climate change risks. Although slightly different in focus and structure, ecosystem-based adaptation projects contribute collectively to the City's experience and track record in managing river systems for locally important socio-economic, financial, and ecological benefits. These projects support cost-efficient delivery of city services. Projects also have a strong focus on community involvement, capacity/skills development, and the creation of economic opportunities for low-income populations. eThekwini Municipality has built a strong policy base and institutional buy-in for riverine management, especially in partnership with other stakeholders.
- The importance of the TRMP and the rationale for upscaling was further evidenced by the extensive damage and devastation caused by the April 2022 flood events within eThekwini.

There was extensive damage to infrastructure at river crossings and to services adjacent to the rivers. Analysis has shown that IAPs and solid waste were the main causes of blockages, which exacerbated the ensuing damages. The damage resulted in monetary losses for both public and private stakeholders, as well as in substantial social costs to society and in particular to poorer communities. There were notably fewer blockages and less damage to infrastructure in areas linked to the streams being managed under the Sihlanzimvelo Programme, which provides hard evidence of the benefits of a riverine/EI management programme. Recognition of these benefit returns by private, public, and civil society stakeholders is demonstrated by the growing support by all sectors for the expansion of the TRMP.

5.2.3 *Funding mechanisms applied and criteria for securing funding*

5.2.3.1 *Funding mechanisms*

- A motivation for internal funding from municipal budget is needed and if successful this funding is then allocated as a standing line item in the annual budget – once allocated it cannot be taken away (with condition that it must be spent every year). If it is spent and targets are met, then it is unlikely that the item will ever be removed – e.g. eThekwini's Sihlanzimvelo programme has been going for more than 10 years.
- Municipality imposes full tender processes and performance management conditions as well as payment structures of the municipality, when it is funding a third party for EI. Normally, these are funded through rates based OpEx (operating expense) budgets of the different departments. The approach is determined by an individual within the department that realises that it is cheaper to go the EI investment route rather than implementing traditional engineering methods.
- DBSA provided funding through the National Green Fund.
- Businesses might invest directly in EI as part of their CSR initiatives or operational sustainability strategies.
- Public-private partnerships (PPPs) where private sector investment is leveraged with public funding to implement larger-scale projects.
- Grants and subsidies from government or international bodies aimed at environmental conservation and sustainability.
- Green bonds or sustainability-linked loans which offer financial instruments specifically for environmental and sustainable projects (e.g. National Treasury has funding in the form of green bonds driven from renewable energy and climate change).

5.2.3.2 *Criteria*

- Some funding comes in the form of grants with no specific conditions, other than reporting requirements.
- Criteria differ from funder to funder, for example:
    - Co-funding frequently has criteria/conditions:
        - Often a criterion as it helps to demonstrate the applicant's effectiveness and track record in the field.

        - Can be challenging in terms of exchange rate risks e.g. if the South African Rand weakens and co-funding is calculated in foreign currency, it requires increasing budget commitment from treasury.
    - Project advisory committee.
    - Project planning criteria (e.g. logframe, risk identification, assumptions and GANTT Chart).
    - Separate bank accounts might need to be set up to ringfence and manage funds (e.g. DBSA):
        - Can be difficult in a municipality as it is not possible to set up separate bank accounts. However, it is possible to set up a "vote" wherein spending can be tracked and allocated. In the private sector, recipients are required to open a separate bank account for all funds received and all transactions processed for the project.
    - Timeframes (e.g. GIZ required that budget be split over 4 years) with tranches largely being released on the submission of reports.
    - Third party certification of data/outputs and outcomes.
- The funding applicant's track record:
    - eThekwini Municipality has been quite strong in the fields of ecological infrastructure/water and climate change. This is one of the reasons that the TRMP has received so much support, i.e. because Sihlanzimvelo Programme has been running effectively for more than 10 years and is a proven line-item budget.
    - Financial management is also key and due to issues relating to accusations of financial mismanagement being linked to the municipality, there is evidence that the disposition of financiers/donors is changing. This is resulting in less funding going directly to government and often rather via a third party. This has translated into less funding, or straight forward grants being awarded due to concerns around how money is allocated and awarded.
- Audit requirements - most funders require audits (e.g. BMZ require internal and third-party audits) before additional funding tranches are released. Sometimes funders will require an upfront check on whether the municipality has a clean audit in the application process.
- Demonstrate impact and a clear link to funders vision/goals.
    - Being capable of packaging/presenting the concept to funders is critical. Even if it is a sound concept it may not receive funding support unless the applicant is able to demonstrate how it addresses the funders' global vision/goal.
    - GIZ for example provides support to applicants to help proposal development and concept development and how it links to agenda of the funders and global objectives (e.g. GIZ funding for Riverhorse Valley Wetland needed to address two criteria, namely flooding/climate risk and biodiversity improvement).
- Land ownership is a critical criterion e.g. it is unlikely to get authorisation to spend public funds on private/non-state land.
- Additional criteria that are key considerations for private sector funding include:
    - Feasibility and cost-effectiveness - projects need to demonstrate financial viability and potential for return on investment.
    - Alignment with corporate goals - projects that align with the business' sustainability goals, risk mitigation strategies, or CSR objectives are more likely to be funded.

- Environmental impact - clear evidence of positive environmental impact, such as biodiversity conservation, carbon sequestration, or water management benefits.
- Community and stakeholder engagement: Projects that involve community engagement and create social value can be more attractive.

5.2.4 *Funding structures*

- Blended finance is becoming increasingly important, involving for example partnerships between municipal and business role-players, to leverage funding from large donors or DFIs.
- Municipal funding for the TRMP was provided by the Deputy Head of Roads and Stormwater Maintenance out of the Municipality's OpEx funding on the basis that this intervention would reduce the maintenance costs of cleaning and repairing the road crossings. The initial funding was for a 295 km stretch of river courses. A cost-benefit analysis (CBA) was done using this work as a basis and the positive figures from this CBA resulted in further funding being allocated by the Chief Financial Officer (CFO).
- Funding from the private sector has largely been in the form of grants, but with conditions such as achievement of milestones and measurable targets before the release of the next tranche. Output indicators such as hectares rehabilitated, and jobs created are typically accepted in recognition that the longer-term outcomes (such as improved wetland functioning and social justice) are not possible to measure during funding cycles of three to five years.
    - Funding structures with strict timeframes can be challenging for the public sector to administer due to administrative systems and delays associated with complex bureaucracy, e.g. appointment of service providers can cause significant delays that affect overall delivery within the funding timeframes.
- Funders want implementers to measure the results while doing the work, however, many benefits/outcomes are not measurable during the project funding term and are only realised in the longer term.
- Funders may require memoranda of understanding, and some may only provide funding to non-profit organisations.

5.2.5 *Business case for investment in water-related EI*

- A CBA and strong business case are strategically important for securing funding for EI restoration.
- The TRMP business case models illustrate how every R1.00 in municipal TRMP investment, R0.30 in damage to municipal road culverts could be avoided. Furthermore, the societal co-benefits from this investment are notable, with a significant number of vulnerable riverine communities being protected from losses linked to damaged infrastructure and increasing exposure to risks associated with declining river conditions. Each R1.00 municipal spend benefits these groups by R0.80, more than double the benefit created from management of private or Traditional Authority riverine areas. Coastal users stand to benefit by a further R2.50 without the municipality incurring additional costs. Finding appropriate cost sharing mechanisms that allow these groups to contribute towards securing the coastal benefits from riverine management would be wise. This could, for example, be achieved through a special coastal hotel bed levy, or through coastal Special Rating Areas that contribute funding towards transformative riverine management. Overall, each R1.00 spent by the municipality on

transformative riverine management on its own land could generate up to R5.23 in municipal and societal benefits (Mander et al., 2021: 72).

- TRMP business case also argues that there is "potential to create 9 181 jobs through more than 1 000 community co-operatives in a city-wide TRMP. In addition, enterprise development in the green economy is possible through the productive use of organic biomass and litter collected from rivers (as well as solid waste collection in informal settlements to prevent it washing into rivers)" (Mander et al., 2021: 13).
- According to the eThekwini Profile Analysis, District Development Model (Department of Cooperative Governance and Traditional Affairs, 2020), 18.7% of eThekwini's population was unemployed in 2020, which is approximately 745 690 people. While there is strong evidence that Sihlanzimvelo-like activities contribute to employment for some of the most vulnerable communities in eThekwini, more evidence is needed to understand the full range of societal benefits from the TRMP, particularly in terms of sustainable livelihoods and lifting people out of poverty. This aspect has been understudied relative to other benefits that have been explored while developing the TRMP.
- Studies show that many of Durban's rivers are already severely impacted by urban and agricultural development, and pollution. It is estimated that the ecosystem services supplied by these urban rivers are 42% below the theoretical best case and that climate change will degrade these systems further, reducing ecosystem services supply by a further 11% by 2040. eThekwini will be directly affected, with annual damages to municipal road culverts alone due to increased climate-change-related flooding estimated at over R151 million by 2040. Declining river water quality will affect coastal tourism and property values, as well as the ability of riverine communities to access and use rivers for household water provision, crop irrigation and recreation (Tooley, 2022).
- The annual cost implications for the wellbeing of municipal citizens and coastal users are estimated to reach R224 million by 2040. (Only historic damage costs to culverts were available to use in this study and so it is recognised that costs indicated are lower than what will be experienced once all infrastructure damage is totalled.).
- The CBA shows that if the city upscaled the existing Sihlanzimvelo programme on municipal land – approximately 1 168 km of river – this would cost the city approximately R92 million annually. The city would experience avoided damage costs to municipal culverts and road crossings of R59 million (this excludes damage to sewers, watermains and other municipal infrastructure). The societal benefits each year are estimated to be R177 million; 234 co-operatives would be needed to do the work, which would create some 1 557 jobs. This translates to R2.60 in benefits for every R1.00 spent by the city. The additional green economy opportunities in terms of job creation and economic benefits have not been included. In turn, for a city-wide TRMP, the CBA shows that an investment of R7.5 billion by the public and private sector is required over the next 20 years. This would result in an avoided cost of R 1.9 billion in damage to municipal culverts and roads (this excludes damage to sewers, watermains and other municipal infrastructure), R12 billion to R24 billion in societal benefits, greater than 9 000 jobs and many additional green economy opportunities. This translates to R1.80 to R3.40 in benefits for every R1.00 spent (Tooley, 2022).

5.2.6 *Extent to which EI investment contributes to social justice*

- The management of EI has provided security and resilience against flood risks and heavy rains i.e. in ensuring that the wetland functions properly and as it should, thus residents and infrastructure are protected from flood risks.
- Community responsibility, accountability, and development has been established. In having the community managing and rehabilitating the wetland, the community has developed a system of accountability and responsibility amongst themselves to ensure that the wetland works as it should and provides improved ecosystem services associated with flood risk mitigation.
- The management, restoration and protection of the wetland has embedded a sense of agency in community members by addressing challenges linked to security and resilience to flood risks.
- The TRMP has provided a platform for:
    - Community empowerment and awareness on climate change.
    - Awareness creation and knowledge exchange on IAPs, natural infrastructure, and ecosystem services and functions.
    - The creation of temporary and permanent employment opportunities and subsequently the upliftment of livelihoods and wellbeing.
    - Ensuring security and building resilience against flood risks and heavy rains.
    - Building a sense of ownership of the environment in the community.
    - Social cohesion and encouragement for communities to work collectively towards a common cause.
    - Collaboration between the municipality, civil society organisations, private sector, NGOs and communities broadly.

5.2.7 *Key lessons were learnt from initiatives in uMhlangane*

- The TRMP/Sihlanzimvelo Programme has remained on eThekwini Municipality's budget for more than ten (10) years because it has been able to demonstrate positive impacts, including avoided cost to municipality that is a high priority for public institutions. Public funding has helped the municipality to leverage other funding to expand the programme.
    - This demonstrates opportunities created through awarding seed funding that enable implementers to demonstrate that they are able to deliver on their concept, which can then unlock further funding opportunities.
    - eThekwini Municipality should not choose between the option of upscaling Sihlanzimvelo or implementing a TRMP approach. Rather, a blended process is recommended, involving upscaling of Sihlanzimvelo as a known, tested implementation model, with incremental introduction of transformative management in priority locations where the additional investment will yield greatest benefits.
- The nature of EI rehabilitation means that it is very difficult to demonstrate quantifiable change during a funding term/grant e.g. 1 to 3 years. Funders requiring the achievement of quantifiable indicators to secure investment need to recognise these challenges and need to consider alternatives such as output indicators, linked to theory of change, in the form of

shorter-term indicators (e.g. hectares of IAPs cleared as an output that will contribute to the outcome of improved wetland functioning).

- The importance of developing an effective funding relationship must be recognised i.e. it is important to be transparent, clear, and honest upfront of what can and cannot be done within the stipulated timeframe. This helps to establish a funder and funding recipient relationship, and to be upfront about funding expenditure and hinderances e.g. startup lags and spreading funding spend. The programme implementers need to be capacitated to understand the language and requirements of the donors when starting the applications. The project staff at financing institutions also need to be capacitated to understand EI and the importance and opportunities for benefits from EI management and rehabilitation.
- It is important to be ambitious/confident to take advantage of opportunities presented by the funding as there are increasing opportunities for EI investment for example linked to climate finance. There is a– need to "go for it and leap in there" to develop a good track record and open doors to other funding opportunities.
- Developing a business case is increasingly important – being clear about what benefits are and what returns can be expected. There might not always be a financial benefit, but it is important to collect the evidence to support the business case and funding application. The programme implementers need to collect evidence to show the tangible benefit of the program on EI management. The method of building a business case around investment e.g. modelling flows/hydrology, is increasing among funding recipients and funders. In the case of uMhlangane and wetland restoration initiatives – eThekwini Municipality had built into the proposal the need for a baseline assessment of flood attenuation capacity of the wetland because that was the big focus of the funding in addition to the water purification services. At the end of the four-year programme the assessment was repeated, and it was possible to demonstrate benefits/impacts due to the nature of the wetland's functioning capacity. In other ecosystems where response times are slower, there is a tendency to adopt output level indicators and quantifiable measures e.g. jobs created, or hectares cleared.

6. *THE KLEIN SWARTBERG INITIATIVE*

6.1 Background

This case focusses on a small-scale ongoing initiative in the town of Ladismith, located in the Western Cape, where the local businesses most directly threatened by water insecurity have been investing back into the catchment area which supplies them with water, thereby supporting a circular economy. The catchment area lies in the Klein Swartberg Mountains (**Figure 6-2**), and a contribution is being made to securing Ladismith's water supply through the clearing of IAPs. An application developed by SAEON is being used annually to rapidly estimate the water savings associated with the clearing. This evidence of the outcome of the EI intervention is then reported to local businesses funding the interventions, and the reported verified area cleared, and annual savings of water plays a key role in sustaining the funding. The initiative aims to strengthen partnerships and contributions from the private sector and civil society and has been working with key farmers to develop a locally tailored approach involving the mobilisation of temporary farm workers during periods when the demand for labour on the farms is lowest. Key stakeholders in the case study are the Mountain Club of South Africa (MCSA) (through which the participation of volunteers is promoted), local businesses in Ladismith (notably Ladismith Cheese and Lactalis), local farmers from the areas surrounding Ladismith, the Kannaland Municipality, Cape Nature, and the Gourtiz Cluster Biosphere Reserve (**Figure 6-1**). The results of the key guiding questions are outlined below.

Figure 6-1 Local temporary farmworkers and a member of the Mountain Club of South Africa involved in hakea clearing in the Klein Swartberg

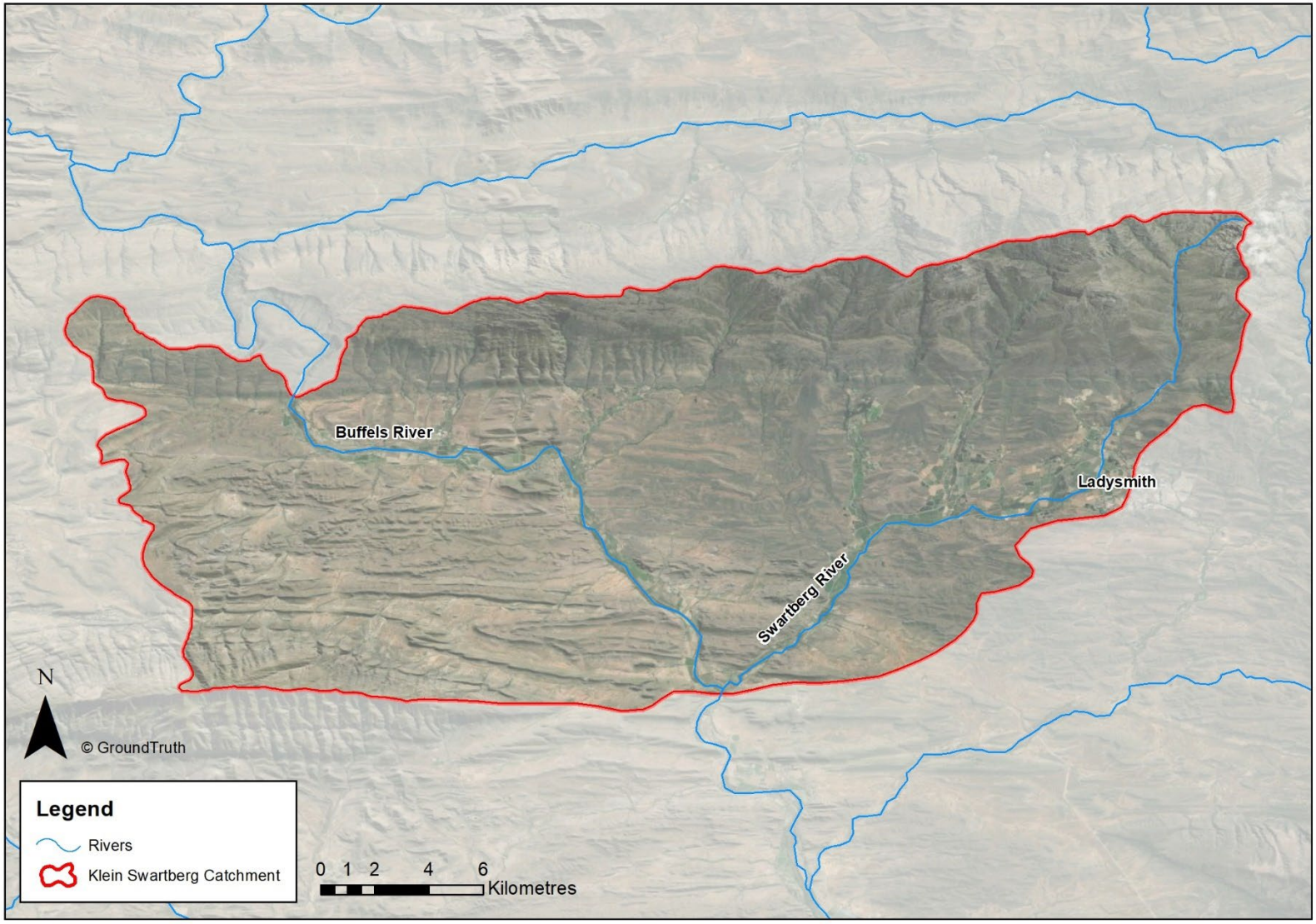

Figure 6-2 Overview of the Klein Swartberg catchment area in relation to the town of Ladismith

6.2 Insights and lessons from stakeholders

The key lessons and experiences on financing of EI management and restoration highlighted by stakeholders in the Klein Swartberg catchment are summarised below.

6.2.1 *Ecosystem service returns (outputs and outcomes) from EI interventions*

Outputs:

- Clearing of approximately 47 000 hakea (*Hakea sericea*) trees and 303 ha of hakea-infested mountain catchment immediately upstream of Ladismith town (**Figure 6-3**). Prior to clearing, the cleared area comprised a mosaic of low to medium infestation with some small patches of high infestation.
- 209 person days of employment was provided for local individuals who depend on temporary work and are often without work during times of the year when the demand for labour on local farms is relatively low.

Figure 6-3 Clearing of hakea underway in a portion of the Klein Swartberg catchment which supplies Ladismith town with its water

Outcomes:

- Freeing up an estimated 10.7 million litres of water per year, which is now available to supply Ladismith town located downstream thereof.
- Reduced water security risks to Ladismith town and its businesses, particularly during droughts, the frequency and intensity of which are projected to increase with climate change. Ladismith is an arid-zone town entirely dependent for its water supply on the much wetter mountains nearby, where the clearing of hakea took place.
- Reduced risks of the occurrence of extreme fires. Hakea, which is well adapted to intense fires, substantially increases the combustible biomass compared with the indigenous fynbos.
- Significantly reduced risks to the mountain's biodiversity, in particular to the hydrologically vulnerable seep wetlands and their dependent species, most notably the endangered Ladismith Yellow Keurtjie (*Stirtonanthus chrysanthus*) confined entirely to mountain seep wetlands north of Ladismith, which is exactly where the clearing has focussed.

The above outcomes have all contributed (albeit still on a small scale) to multiple aspects of resilience of the social-ecological system, including: 1) increased resilience for Ladismith's mountain ecosystems and dependent businesses and households in relation to risks from droughts and wild fires, both of which are projected to intensify generally as a result of projected global climate change; 2) increased institutional resilience through strengthened partnerships and contributions from civil society (Mountain Club of SA), private sector (two of the largest businesses in Ladismith and three local farmers) and an NGO namely the Gouritz Cluster Biosphere Reserve (GCBR); 3) increased economic resilience of the initiative through the accessing of multiple funding streams and the main businesses benefiting from water resources are investing back into the management of the ecosystem supplying the water, thereby supporting a circular economy and reducing the reliance on external funding sources; and 4) increased household resilience for temporary workers (albeit for an extremely small number of individuals) through an additional income source at a critical time of year.

Role-players involved in planning, funding, and implementing the EI investment

The initiative emerged out of the volunteer clearing of hakea by three MCSA members living in Ladismith, who were motivated by their desire to contribute to the ecological health of the mountain ecosystems that they enjoy, while at the same time appreciating the physical experience involved in the clearing. The MCSA has remained the champion for the initiative, with one member taking a lead role in terms of ongoing supervision, reporting and liaison with the funders. The initiative was precipitated by an appeal made by the MCSA members for volunteers to participate in a hakea clearing event in Ladismith's mountain catchment in early 2019. A farmer responded to the appeal and proposed that while not participating themselves in the clearing day, they would sponsor some of their temporary workers to do so. This led to the farmer approaching two other farmers, and the three farmers jointly sponsored three days of clearing. The success of this clearing provided a tangible "proof of concept" which was then taken to the two largest businesses in Ladismith as potential sponsors and as expanded in **Subsection 6.2.5**, this was key in securing their first commitment to funding, which continued for two subsequent years. This sustained commitment was aided by the involvement of an NGO (GCBR) who provided monitoring, quality-control, and reporting input in the second year of the initiative and a reporting system which continued to be applied in the following two years.

It is important to note, however, that poor service delivery in town, including interruptions to both electricity and water supply have indirectly influenced the readiness of businesses to contribute to green infrastructure maintenance. In terms of the extensive electricity supply load-shedding, all local businesses are having to contend with massive diesel bills, while for assured water supply one of the Ladismith businesses shared how they have been forced to become directly involved in monitoring in order to avert critical interruptions to their supply. This reflects the national trend of the private sector being forced to step into areas that are generally the responsibility of the state in most countries (Naidoo and Sguazzin, 2023). This is likely to contribute positively to increased awareness amongst businesses of the limitations of a one-dimensional focus on grey infrastructure. Nevertheless, as businesses become increasingly burdened financially by the state's neglect of grey infrastructure, practically it will become increasingly challenging for these businesses to contribute financially to EI.

6.2.2 *Relevance of the returns (outputs and outcomes) to key role-players and funders/investors*

The water yield benefits described above are highly relevant to downstream farmers and businesses in town, who depend entirely on the water supplied by the mountain catchment where the hakea

clearing took place. The two primary sponsors of the hakea clearing are the two largest businesses in town as well as its two largest water users, further emphasising the relevance of this increased water yield. One of these businesses described how they recognise that they are a major water consumer who drives daily water saving initiatives at plant level, not just for the future existence of the business but also for the benefit of the rest of the town's water users. Prior to the initiative, they saw upstream areas as being largely out of their control and not their speciality, and therefore they were glad for the opportunity to support an initiative focussed on addressing a key upstream issue.

For the two business sponsors, the water security, biodiversity, and job creation contributions all have relevance to the stated commitments from both companies in terms of general sustainability and corporate social responsibility. Thus, their investment in EI through the initiative is seen as contributing positively to achieving these stated commitments.

For the contributing farmers, the job creation contribution has relevance to their expressed desire that their temporary workers can access employment during quiet times of the year. An additional opportunity afforded by the initiative was to contribute to the general good of Ladismith town and its residents, for all of whom water is essential. Also mentioned by the contributing farmers was the opportunity that participation provided for "giving back to nature", in the context of being grateful for some memorable experiences in the mountain above Ladismith in the past even if one is too busy now to get into the mountains.

For the MCSA volunteers, the contribution of the initiative to the ecological health of the mountains and associated fauna and flora (from which personal enjoyment is derived) was of particular relevance. In addition, direct active participation in the clearing itself was viewed positively in terms of meaningful engagement with a "higher purpose" and for the opportunities afforded for physical exercise and challenge, as derived from a sport (Kotze and Rebelo, 2021; Kotze, 2018).

6.2.3 *Funding mechanisms applied and criteria for securing funding*

The process through which funding was obtained could be described as organic and incremental rather than being initiated from the outset through a formal process (e.g. as is typical of grant applications). From the timeline of the initiative (**Table 6-1**) it can be seen that following the initial funding by local farmers, the principal funding of workers has been from two local businesses. Local in-kind contributions by local farmers and MCSA members to critical aspects of the project around managing and paying the workers and monitoring and reporting have continued throughout. The contribution of GCBR, while relatively small (**Table 6-2**), was strategically valuable, especially in allowing for reporting back to the primary funders in a "water currency" to which they could relate.

Table 6-1 Funding sources for the Ladismith hakea-clearing initiative over its four-year period thus far

Outputs and funding sources	2019/2020	2021	2022	2023	Totals
Work output:					
Hectares cleared	7	39	78	179	303[1]
Density of hakea infestation	Medium and high	Predominantly medium	Predominantly medium	Medium and low	-
Approximate number of trees cut	8 000	11 000	16 000	12 000	47 000
Person days of work completed[2]	24	45	75	65	209
Sponsorship for workers by:					
Local farmers (3 farmers)	R5 000				R5 000
Ladismith Cheese		R6 000	R10 000	R11 000	R27 000
Lactalis		R6 000	R10 000	R11 000	R27 000
Additional contributions:					
Local in-kind contribution by local farmers and MCSA members for transporting and supervising workers and administering finance and worker payment	R2 880	R5 670	R9 900	R8 970	R27 420
Sponsorship from GCBR for equipment	R1 200		R2 400		R3 600
Sponsorship from GCBR for monitoring and reporting		R12 000			R12 000
Local in-kind contribution by MCSA members to monitoring and reporting			R8 000	R11 000	R19 000
Totals	*R15 664*	*R37 880*	*R51 425*	*R49 550*	*R121 020*

[1]Additionally, follow up clearing of the 46 ha cleared in 2019-2921 was also undertaken during the course of 2022 and 2023.

[2]The total number of individuals working fluctuated from year to year, ranging from 9 to 14.

6.2.4 *Funding structures*

Funding was through a combination of donations and in-kind contributions (**Table 6-2**). The bulk of the funding (87%) was from local businesses and local in-kind contributions. External funding (13%) was from an NGO. No funding was obtained from government.

Table 6-2 A summary of the sources of funding for the Ladismith hakea-clearing initiative over the period 2019-2023, detailed in Table 6-1

Source of funding	Amount in Rands	Percentage of total amount
Donations from local businesses	R59 000	49 %
Local in-kind contribution by local farmers and MCSA members for transporting and supervising workers, administering finance, worker payment and monitoring & reporting	R46 420	38%
Donations from an NGO, Gouritz Cluster Biosphere Reserve	R1 560	13%

Funding has been for four years, with sponsorship from the two largest businesses being for the last three of these. Funding was secured on a year-to-year basis and was conditional on progress being demonstrated at the end of the previous year. Each year, one of the two main business sponsors provided the lead in responding to the request for funding, with the other following and matching the amount sponsored by the "lead business". For all three years, it was the same business responding first to the call. Funding payments were generally made towards the beginning of most years, but there was once a long delay, for which the key farmer who was administering payments "bridged the gap" until payment had been made.

6.2.5 Business case for investment in water-related EI

The business case for the farmers and local businesses was built almost entirely around investing in their own water security. An initial attempt was made in 2019/2020 by a volunteer from the Mountain Club of South Africa to communicate this concept, which proved unsuccessful. Prompted by a call for volunteers, the lead farmer suggested the idea of sponsorship of three clearing days and also persuaded two other farmers to contribute. Their commitment was secured with MCSA members agreeing to supervise the three days. The lead farmer (who is also the owner of an agri-processing business in Ladismith which dries fruit) then called a meeting with Ladismith Cheese and Lactalis in 2021 and successfully pitched the concept and they agreed to fund workers in that year. Ladismith town was lacking any formal business forum at the time through which the meeting could be called, and instead the meeting was arranged through informal channels, drawing on the relationships that the lead farmer already had with key individuals in the two businesses.

Gaining the evidence needed to strengthen the business case required that the volume of water freed up by the clearing be estimated. To this end, the application developed by Glenn Moncrieff of SAEON (https://gmoncrieff.shinyapps.io/aliens_waterloss/) was used to roughly estimate the water savings associated with the clearing. This takes into account the species and its age class, density class and climatic context, and is based on the method of Le Maitre et al., (2016), which draws from a considerable body of research on the effects on surface water runoff of a wide variety of IAPs in multiple contexts and refines the earlier method of Le Maitre et al., (2000). The estimated volume of water freed up by the clearing was communicated to the funders by an MCSA member in the form of an annual report. The report also included a map showing the specific area cleared and photos of the clearing underway. This assisted in providing evidence to the funders that the funding was achieving its intended purpose and was not being wasted.

6.2.6 *Extent to which EI investment contributes to social justice*

A high proportion (>70%) of the donor funding for the initiative was for wages for workers. These were mainly temporary workers, with most of the work provided during the "quiet" periods on the farms when work is in shortest supply and temporary workers are most vulnerable to financial hardship. The initiative therefore contributed to the resilience of participating workers. However, as the initiative's overall budget was small, the number of paid days was relatively small. While workers were able to gain new experiences and potentially increase their employability, the initiative did not capacitate a contractor or the development of any enterprises. In addition, given that the work is physically extremely demanding and the pool of workers from which the project draws are all male, no females were represented in the workforce. Thus, the overall direct contribution of the initiative to social justice has been limited.

Nevertheless, the contribution of the initiative to reducing the risks of both water shortages during drought conditions and extreme fires can be seen to have had a particular contribution to Ladismith's most materially poor residents. This is in the sense that extreme events, be they fires or critical water shortages, generally have a proportionally higher impact on the poor than the wealthy, who are more "sheltered" from their effects, e.g. through insurance and having greater material means to take mitigatory action. Furthermore, when economic activity contracts, as typically occurs to the agricultural sector in droughts, unskilled labour are usually shed to a greater degree than skilled labour. Thus, once again, it is the poorest people who are most severely affected by extremes.

6.2.7 *Key lessons learnt from the initiative*

Key lessons:

- *It is critical to build relationships and trust.* While stating the obvious, relationships and trust are foundational, particularly for initiatives which evolve organically and do not have many explicit formal mechanisms to structure interactions and uphold accountability.
- *Start small and grow incrementally*. Allied with the "organic" development of the initiative is the need to build it incrementally rather than being in a rush to demonstrate quick results. Small initial successes were used to leverage the "buy-in" of additional role-players and their associated resources. Here it is important to acknowledge that the initiative is still small and growing.
- *Use peer-to-peer/business-to-business interactions to draw in new partners*. As described earlier, a local business proved much more effective in persuading the two major businesses in town to participate in the initiative than the initial attempts at persuading by a representative of the MCSA.
- *Build on existing local strengths and arrangements* (e.g. an existing pool of "work-fit" temporary workers for which arrangements for transport and payment already exist) rather than establishing these from scratch. This was particularly the case given the incremental development of the project, its limited budget, and the degree to which it relied on in-kind contributions.
- *Align timing of work with the local situation.* Allied with the locally based incremental development of the initiative is the need to harmonize the initiative with the local situation. This included focussing the work activities of the initiative as far as possible during "quiet" periods in the local "calendar" of work activities.

- *Communicate outputs and outcomes to partners* to promote accountability, build trust and confidence in the initiative and effectively grow and maintain support.
- *Learn from failures and remain adaptive*. The initiative was born out of a failure to hold the state responsible for continuing to clear IAPs in Ladismith's mountain catchment, which is state-owned land. This, in turn, led to seeking alternative funders, with a focus on those who were anticipated to benefit from the clearing. This ultimately resulted in funding (albeit small amounts) being secured from several of the key downstream water users.
- *Major funding from formalised grants or the government should not be seen as a necessary prerequisite for investment in EI*. By using existing local mechanisms, ways can be found of "stretching the Rand" and harnessing in-kind contributions, so as to advance surprisingly far in achieving the intended outcomes of the initiative.

Scalability of the initiative:

Based on the contribution of the initiative thus far and the lessons learnt, it would appear to provide the basis for serving as an innovative "seed" which is not currently mainstream but has the potential to be "scaled out" and "scaled up", as described by van Velden et al., (2023).

In terms of scaling out across Ladismith's mountain catchments, there is still at least 2'000 ha remaining where clearing of hakea is required, and into which the initiative could be expanded. A formal assessment of this area has yet to be undertaken, and this is recommended for planning and budgeting purposes given that the level of infestation appears from informal observation to be very heterogenous across this area.

In terms of scaling out more broadly, it is noted that there are several small towns in a similar situation to Ladismith, with residents and local businesses strongly dependent on their adjacent mountain catchment for their water supply. Some of these towns already have a core of volunteers engaged in IAP clearing initiatives. In a few cases, the volunteer initiatives are well developed and the outcomes are being reported on social media in a comparable fashion to those of the Ladismith initiative, e.g. as reported for the Wild Restoration Greyton "Helihack" week (https://www.wildrestoration.org/the-greyton-mountain-project). However, in other towns, such a core group is absent or in need of strengthening. A recently formed action and learning network for local groups involved in invasive clearing within the Cape Floristic Kingdom could potentially play a role in helping facilitate the strengthening of weaker groups. The network, which is hosted by Wild Restoration (https://www.wildrestoration.org/), seeks to promote sharing of information and practices, re-energising individuals and collaboration across local groups.

A platform which may potentially assist with scaling out is a project set up on iNaturalist, the Ten Thousand Tree Mountain Fynbos Challenge, where different groups/initiatives/individuals who are widely scattered across the Fynbos Biome are able to post information on IAP clearing events which they undertake, and which works towards a common target of clearing 10'000 invasive alien trees within Mountain Fynbos during the course of a month (https://www.inaturalist.org/projects/the-ten-thousand-tree-mountain-fynbos-challenge). To date, over 150'000 trees cleared trees have been recorded from a total of 138 posts on the project, of which 31 are from the Ladismith initiative.

In terms of scaling up, a key aspect is to build longer term commitment to the initiative from the existing role-players so that its long-term fate will be less dependent on individual champions. A further aspect is securing more formalised and binding involvement of CapeNature to assume greater

responsibility in the initiative. This would include: 1) supervision of the sponsored teams, thereby freeing up volunteers to focus on the remotest areas; and 2) oversight in terms of best practices being followed with the clearing. Regarding CapeNature, the potential exists for influence at a higher level in the organisation in terms of policy and strategy relating to how the organisation better engages with private enterprises and other role-players around the control of IAPs in the mountain catchments for which CapeNature have a management responsibility. However, with all these possibilities for scaling up, it is important to recognise the existing informal and flexible structure of the initiative which has allowed it to grow and adapt. Thus, any scaling up needs to be careful not to become overly constraining on the initiative, as might occur if efforts to formalise current arrangements amongst the different role-players becomes too rigid. The same principle also applies to the local municipality, whose active participation in the initiative is also seen as desirable for the long-term sustainability thereof.

As described earlier, the business case for the initiative was focussed strongly on water supply for local users in Ladismith town. However, the initiative also has clear biodiversity benefits at a local, regional, and international level. This is given to the floristic uniqueness of the area under threat, the many threatened endemic species it contains (including, amongst others, the endangered *Stirtonanthus chrysanthus*, Critically Endangered *Psoralea rubicunda,* and Vulnerable *Protea aristate*), and the international importance of the Cape Floristic Region, within which it falls. The control of hakea also benefits aquatic fauna of the Ladismith's mountain catchment area, including the Near Threatened Slender Redfin (*Pseudobarbus tenuis*). Thus, the initiative could potentially be a candidate for international funds for supporting biodiversity priorities.

Ultimately, in scaling out and scaling up the initiative, potential exists for developing a "bankable project" including both biodiversity and water security linked with climate change adaptation in the package of outcomes to "sell" to additional funders/donors.

7. CONCLUSION

The purpose of the evaluation of the four selected EI initiatives is to provide evidence-based information of appropriate EI initiatives and management currently active in South Africa demonstrating the intangible and tangible benefits of EI investment. Furthermore, owing to the diversity of the selected initiatives, the review provides a rich account of how management of EI affects water users within the specific catchments and highlights the mechanisms that catalysed the investment in these initiatives. The review was supported by a stakeholder engagement process which sought to understand and provide insight on inter alia, the quantifiable ecosystem service returns from the EI interventions implemented in the initiatives and the relevancy of the returns identified to private and public stakeholders. The review of the initiatives coupled with the targeted stakeholder engagement process provides a rich and real-world experience of EI investment in South Africa, which is useful in promoting and allowing for the mainstreaming of EI into the water value chain.

The following common themes emerged as mechanisms or enablers for EI investment across the four implemented initiatives, and were used to inform the development of a user-appropriate framework for investment in EI:

- Development of a business case which provides a clear depiction of the socio-economic and more particularly the water-related benefits of the implemented EI interventions. A business case is supported by evidence that demonstrates the expected returns of the EI investment alongside the intended objectives for the project, is important in attracting investment from the private sector and supporting the funding application process. Thus, collection of this evidence should be considered and prioritised to either lobby for more funding to upscale existing implemented EI interventions or fund new interventions.
- Building on existing relationships to strengthen partnerships and build trust has been recognised as having increasing importance, particularly for non-formal initiatives that have organically developed and attracted funding over time. The established trust within partnerships of this kind, can potentially be leveraged by project implementers to potentially access new funding opportunities and upscale existing EI initiatives.
- Having a local champion within the area where the EI intervention is being implemented is important for sustainability of the EI project, as it builds a sense of ownership and responsibility in the community for their natural resources.

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9. *APPENDICES*

9.1 APPENDIX 1 Literature review and EI case study report

EMPIRICAL AND USER-APPROPRIATE EVIDENCE TO SUPPORT DFIS AND PRIVATE SECTOR INVESTMENT TOWARDS MANAGING ECOLOGICAL INFRASTRUCTURE

Literature review and EI case study report

N Sithole, D Kotze, M Browne, F Lewis, & S Mahlaba

Report to the
Water Research Commission

By
GroundTruth

EXECUTIVE SUMMARY

This literature review and EI case study report forms part of a broader Water Research Commission (WRC) study which aims to provide an in-depth analysis (both grey and polished literature) of EI management interventions across South Africa and internationally. Ecological Infrastructure (EI) plays the fundamental role of providing essential goods and services required for social, economic, and environmental wellbeing (Mbopha et al. 2021). These services include *inter alia*, mitigation of climate related risks, regulation of ecosystem processes (e.g. water cycle) and provision of food and water for humans (Rasmussen et al. 2021). Despite the vital benefits of EI, our natural resources continue to deteriorate rapidly, due to anthropogenic activities, a rapidly growing population and climate change, which adds increased pressure on already scarce natural resources. Water is vital for human survival and forms the raw material in a range of industrial processes. However, globally, this resource has become degraded and is in short supply to meet the demand of a growing population. According to Mishra et al. (2021) over 1.1 billion people lack access to sufficient drinking water globally, while 2.6 billion people lack access to proper sanitation facilities. Inadequate access to water, poses socioeconomic and human development challenges, particularly for developing countries of which a majority of the population is located in rural communities and rely on natural resources for their livelihoods. South Africa is regarded as a water scarce country and faces a range of water security challenges. Thus, the national government has made continuous efforts to restore water-related ecological infrastructure to increase water security whilst contributing to economic development (Rebelo et al. 2021). Despite this, there is still a lack of investment in EI by private sector, which can be leveraged by developing a more detailed evidence base of the financial returns of EI investment (Rebelo et al. 2021).

This report forms part of the first phase of the iterative stakeholder engagement process of the broader study and includes a review of literature, an in-depth analysis of four implemented EI investment initiatives and an initial stakeholder engagement process.

The following set of guiding questions were adopted during the initial stakeholder engagement process of the four EI initiatives and further informed the literature review process:

- What are the quantifiable ecosystem service returns from EI interventions in the case study area, especially those related closely to water security?
- How relevant are the returns described above to key role-players, in particular for private sector role-players?
- What underlying mechanisms (enabling and inhibiting) affected collaboration (including public-private collaboration) in implementing the interventions?
- What is the business case for private sector investment in water-related EI within the case study and how was this developed and communicated amongst the role-players?
- To what extent has the EI investment contributed to social justice?

Some of the elements that emerged from the review which are useful in informing the second phase of the stakeholder engagement process and broader study include, *inter alia*:

1. A detailed evidence base of the financial returns of EI investment is required to leverage private sector investment in EI.

2. Integrating green and grey infrastructure in urban and peri-urban areas contributes to building resilient cities against climate change and provides a range of co-benefits to meet the growing demand of ecosystem services.
3. Investment in maintenance of EI is a more cost-effective approach to restoring degraded EI.
4. Investment and maintenance of EI can positively contribute towards longevity and costs of maintaining built infrastructure.

The objectives of the literature review and EI case study report were achieved, and these elements will contribute to the second phase of the stakeholder engagement process which will inform the framework development process. The next step of the broader study will be to conduct a more comprehensive stakeholder engagement process to inform the next deliverable.

LIST OF ACRONYMS

Acronyms	Explanation
AEN	Amanzi Ethu Nobuntu Programme
AFD	French Development Agency
AfDB	African Development Bank
AWS	Alliance for Water Stewardship
BASA	Banking Association South Africa
B-BBEE	Broad-Based Black Economic Empowerment
BCSC	Business Case Sub Committee
BLU	Biodiversity and Land Use
BMZ	German Federal Ministry for Economic Cooperation and Development
BOCMA	Breede-Olifants Catchment Management Agency
BRICS	Brazil, Russia, India, China and South Africa
BUSA	Business Unity South Africa
CARA	Conservation of Agricultural Land Resources Act (Act No. 13 of 1983)
CBA	Cost-Benefit Analysis
CCVA	Climate Change Vulnerability Assessment
CEA	Cost-Effectiveness Analysis
CEO	Chief Executive Officer
CFF	Cities Finance Facility
CFO	Chief Financial Officer
CICLIA	Cities and Climate in Africa
CMA	Catchment Management Agency
CMS	Catchment Management Services
CSIR	Council of Scientific and Industrial Research
CSR	Corporate Social Responsibility
DALRRD	Department of Agriculture, Land Reform and Rural Development
DARD	Department of Agriculture and Rural Development
DBSA	Development Bank of South Africa
DEA	Department of Environmental Affairs
DEADP	Department of Environmental Affairs and Development Planning, Western Cape Government
DFFE	Department of Environment, Fisheries and Forestry
DFIs	Development Financial Institutions
DPE	Department of Public Enterprises
DPWI	Department of Public Works and Infrastructure
DUCT	Duzi-uMngeni Conservation Trust
DSI	Department of Science and Innovation
DWS	Department of Water and Sanitation
EDTEA	Department of Economic Development, Tourism and Environmental Affairs

Acronyms	Explanation
EI	Ecological Infrastructure
EI4WS	Ecological Infrastructure for Water Security
EIA	Environmental Impact Assessment
EII-ES	Ecological Infrastructure Intervention – Ecosystem services
EIIF	Ecological Infrastructure Investment Framework
ENCORE	Exploring Natural Capital Opportunities, Risks and Exposure
EPWP	Expanded Public Works Programme
ESD	Enterprise Supplier Development
ESG	Environmental, Social and Governance
ESMAP	Energy Sector Management Assistance Program
EU	European Union
FINNIDA	Finnish Development Agency
FONAG	Fondo para la Protection del Aua
FSB	Financial Stability Board
GCBR	Gouritz Cluster Biosphere Reserve
GCF	Green Climate Fund
GCTWF	Greater Cape Town Water Fund
GDP	Gross Domestic Product
GIZ	German Development Agency
GRI	Global Reporting Initiative
GWSP	Global Water Security and Sanitation Program
IAPs	Invasive Alien Plants
IDP	Integrated Development Plan
INK	Inanda, Ntumzuma, and Kwa-Mashu
IRMSA	Institute of Risk Management South Africa
IUDF	Integrated Urban Development Grant
IWQM	Integrated Water Quality Management
KZN	KwaZulu-Natal
MCA	Multi-Criteria Analysis
MCSA	Mountain Club of South Africa
MIG	Municipal Infrastructure Grant
MOU	Memorandum of Understanding
MSEP	Mpophomeni Sanitation and Environment Programme
NBI	National Biodiversity Institute
NEMA	National Environmental Management Act (Act No 107 of 1998)
NFFC	Natal Fly Fishers Club
NGO	Non-Governmental Organisations
NPC	Non-Profit Company
NPO	Non-Profit Organisation
NRM	National Resource Management

Acronyms	Explanation
NWA	National Water Act (Act No 36 of 1998)
PPP	Public-Private Partnership
PRI	Principles for Responsible Investment
REI4P	Renewable Energy Independent Power Producer Procurement Programme
RSWM	Department of Roads and Stormwater Maintenance
SA	South Africa
SAICA	South African Institute of Chartered Accounts
SAICE	South African Institute of Civil Engineers
SANBI	South African National Biodiversity Institute
SARVA	South African Risk and Vulnerability Atlas
SDG	Sustainable Development Goals
SEBEI	Socio-Economic Benefits of Investing in Ecological Infrastructure
SECO	Secretariat for Economic Affairs Economic Cooperation and Development
SIPs	Strategic Integrated Projects
SMMEs	Small, Medium and Micro Enterprises
SOE	State Owned Enterprises
SWSAs	Strategic Water Source Areas
TCFD	Task Force on Climate Related Financial Disclosures
TNC	The Nature Conservancy
TRMP	Transformative River Management Programme
UEIP	uMngeni Ecological Infrastructure Partnership
UMDM	uMgungunglovu District Municipality
UN	United Nations
UNEP FI	United Nations Environment Programme Finance Initiative
UNEP FI PSI	United Nations Environment Programme Finance Initiative Principles for Sustainable Insurance
USAID	United Stated Agency for International Development
USDG	Integrated Urban Development Grant
UW	Umgeni Water
WCWDM	Water Conservation and Water Demand Management
WESSA	Wildlife and Environment Society of South Africa
WfW	Working for Wetlands
WRD	Water Resource Development
WRM	Water Resource Management
WSIG	Water Services Infrastructure Grant
WULA	Water Use Licence Application
WWF	World Wildlife Fund
WWTW	Wastewater Treatment Works
WWUA	Wolseley Water Users Association

INTRODUCTION

The benefits of Ecological Infrastructure (EI) both within urban and rural landscapes is understood to be important and provide a suite of direct and indirect ecosystem services. However, there is insufficient and readily available information supporting the justification for the rehabilitation and sustained management of ecosystems within the landscape. For example, there is limited quantifiable data depicting the increase in the provision of water-related services and the direct benefits thereof. It is anticipated that in the coming years, with an increase in the population numbers and the impacts of climate change, that EI will become ever more important particularly in supplying sufficient potable water but also providing resilience and supporting livelihoods within a landscape which is likely to suffer from extreme weather events. Therefore, the investment in the rehabilitation and management of EI is becoming increasingly more important. However, without quantifiable and tangible, user-appropriate information, support for such activities will remain limited.

Existing EI projects can provide useful insights regarding the successes and failures/challenges associated with such projects, particularly when exploring the mechanisms that catalysed the interventions/investment. The aim of this study is to provide the various sectors e.g. development finance institutions and the private sector; with the framework to implement EI projects thereby increasing the natural capital within an everchanging landscape, and thereby create resilience within the ecological and social landscapes.

The literature review and EI case study report aims to provide an in-depth review (of both grey and published literature) of EI management interventions both in the South Africa (SA) and internationally. The literature review will support the study in addressing the guiding questions which were drawn from the high-level activities outlined in the terms of reference. The guiding questions were further refined and included in the inception report, and thereafter applied in the preliminary stakeholder engagement process to inform the case studies. This framework is intended to provide the private and public sector with a user-appropriate tool to promote the investment and allow for the mainstreaming of EI projects. This study aims to build on four identified and implemented EI initiatives, located in KwaZulu-Natal (KZN) and the Western Cape Provinces of South Africa. Documenting the successes and challenges, including the mechanisms and funding sources, associated with these initiatives has been informed by the literature review process and the preliminary engagement of relevant stakeholders.

The overarching goal of the research is to derive the lessons and insights from EI investment initiatives where funding has been secured and interventions have been implemented from which to develop the framework.

The specific project aims include of which the first four bullets form part of the focus of this deliverable:

1. To document the evolution of the planning, funding[8], and implementation from selected South African EI initiatives to identify enablers and barriers. This will be further supported by local and international case study evidence.
2. To demonstrate the tangible and intangible benefits associated with investing in EI interventions that impact the water sector, and its role in supporting sustainable development based on empirical data and modelled projections.
3. Engage stakeholders on the value proposition for private and development finance sector investment in EI rehabilitation and management and the potential for inclusion of EI in bankable projects.
4. Identify the information and financial instruments/models/mechanisms needed to catalyse private sector investment in EI interventions especially those linked to infrastructure investment.
5. Develop a user-appropriate EI framework to promote investment and allow for the mainstreaming of EI. The intended users include inter alia public institutions funding water-related ecological and grey infrastructure, private sector stakeholders including small-scale farmers, community-based organisations, cooperatives, corporates, development finance institutions, commercial finance, and SMMEs (Small, Medium and Micro Enterprises) working in the sector, etc. Emphasis here would be on aggregation and scaling up nature-based investment opportunities for multiple role players in the market and creating enabling mechanisms for more small-scale businesses and farmers to engage effectively in nature-based solutions.

For the purpose of this deliverable the report has been separated into two sections, namely Part A which focuses on the existing ecological infrastructure literature, guidelines and general information linked to some implemented cases, and Section B that focuses on the four cases studies linked to this study. It should be noted that Part B in particular, includes a review of the available information/literature pertaining to each of the case studies, with preliminary input from target stakeholders. The deliverable following this literature review will include the outcomes and insights gained from a more detailed stakeholder engagement process.

[8] In this project 'funding' is used broadly and includes sources of capital where a repayment of the capital is not required (e.g. a grant) and where capital is provided with the expectation of repayment and, typically, a financial return or 'cost' in the form of interest or dividends (e.g. a loan). The latter is usually referred to as 'financing' in contrast to funding (OECD 2022).

PART A: LITERATURE REVIEW

CONTEXTUALISATION OF ECOLOGICAL INFASTRUCTURE

This section provides a brief overview of the current state of EI from a regional and national perspective. EI will be discussed in relation to the benefits we derive from it, the challenges that threaten the ecological health of ecosystems and the role of EI investment in restoring and protecting our EI.

Threats to Ecological Infrastructure in Southern Africa

Some of the key challenges threatening the health of the environment in southern Africa includes *inter alia* global warming, climate variability attributed to climate change, biodiversity loss, population growth, alien invasive species, and urbanization (Darkoh, 2009). Climate change in particular has been earmarked as one of the biggest threats to environmental and human wellbeing in southern Africa, posing a socio-economic risk for many developing countries. It is anticipated that rainfall patterns will become more variable and extreme weather events are likely to worsen. This poses a serious threat to southern Africa as the majority of its population is reliant on natural resources such as land and water for crop production and subsistence farming, which forms a major part of their livelihoods. In addition, African cities are regarded as the least resilient to climate change weather related events (Gulati and Scholtz, 2020), as cities can lack the necessary built infrastructure, financial mechanisms, and government support to manage the effects of climate change. Further to this, due to the prevalence of built-up areas in African cities, these can lead to the development of the heat island effect, which increases the temperature of urban areas due to heat retention of infrastructure materials such as building and roads, lack of green spaces or vegetation and vehicles which emit heat (Gulati and Scholtz, 2020). These higher temperatures within African cities coupled with climate change related temperature variations, will likely worsen the effects of climate change.

African cities are experiencing rapid urbanisation rates which will increase the demand of ecosystem services such as water and thus pressure on built and ecological infrastructure. According to Li et al. (2022), it is projected that 60% of the population will be based in cities by 2050. This increase in population will exacerbate already existing challenges associated with urbanization, such as unsustainable land use practices leading to land degradation and unplanned settlement development within high-risk areas, such as wetlands or floodplains (Li et al. 2022).

Climate Variability, Water Scarcity and Ecological Infrastructure in South Africa

South Africa is characterised as the 30th driest country in the world, with uneven rainfall patterns expected to become more variable with the projected climate change related events (NSoW, 2021). According to the National State of Water report (2021), 98% of available water resources have already been allocated for use, making the urgency of finding alternative water sources to support the increasing economic and population demand, imperative. A rapidly growing population, poor land use practices that have led to land degradation, and sporadic weather events, is threatening the state of water security in SA (Petersen et al. 2020). To exacerbate the stress on water resources, the effects of climate change e.g. droughts and flood events, have already taken its toll on numerous communities/cities within SA (DWS, 2018).

The highest water consumer in SA is agriculture which accounts for 61% of total water use across the country. Despite agriculture being the largest water consumer, this sector pays the lowest water charges. Municipal use, which includes industry and commercial users, comes at second place, making up 27% of the total use; followed by mining and bulk industrial use and conservation, which makes up 12% (DWS, 2018). These statistics are evidence of how water is a fundamental resource which underpins functions contributing to human wellbeing, socio economic development and optimum functioning of the environment. It is a central and essential resource, that if managed poorly has severe consequences to both human well-being and the environment, but also results in financial implications (Hossain, 2015).

Financial implications such as the cost of maintaining deteriorating grey water infrastructure coupled with the treatment costs for poor water quality entering a water treatment site, means that additional money needs to be spent to ensure water is potable (refer to **Box 1**). In relation to maintenance of grey water infrastructure, the 2022 green drop report assesses the performance of wastewater treatment plants in South Africa and their ability to treat wastewater. The report highlighted that an estimated 39% of wastewater treatment plants in South Africa are characterised as being in a critical state. Green drop auditors attributed this decline to lack of investment in sewer infrastructure relation to treatment and collection systems, and insufficient skilled labour to operate the systems (DWS, 2023). Related to this, is the declining state of wastewater treatment plants noted from 2014 to 2021, which were expected to worsen if actions to address the underlying causes were not attended to by municipalities (DWS, 2023). The urgency to explore sustainable and potentially cost-effective solutions relating to water security has become ever more important. One such solution includes the investment and restoration of ecological infrastructure (refer to **Box 1**), which includes for example wetlands, rivers, and their associated catchments (Gulati and Scholtz, 2021).

Box 1: Ecological, green and grey infrastructure

Ecological infrastructure refers to natural systems that provide ecosystem services which are fundamental for human and environmental wellbeing. Natural ecological infrastructure works in conjunction with built infrastructure to deliver these ecosystem services (Cumming et al. 2017).

Green infrastructure refers to man-made systems that are semi-natural, which work in conjunction with nature and built infrastructure to deliver ecosystem services essential for human, environmental and economic wellbeing, within an urban or peri-urban context. These systems are aimed at enhancing, preserving, or restoring the natural functioning of natural capital such as wetlands, floodplains, and rivers, and their associated catchments. Green infrastructure contributes to building resilient urban areas that promote socio-economic wellbeing and economic development (Gulati and Scholtz, 2022; Scott et al. 2018).

Grey infrastructure refers to engineered solutions which are hard, man-made structures such as wastewater treatment works (WWTW), reservoirs, embankments, and pumps. These engineered solutions are integrated within watersheds or ecosystems and work in conjunction with the natural environment (Browder et al. 2019).

Ecological infrastructure refers to the connected ecological systems and processes which provide a range of ecosystem functions/services (direct and indirect) for human, environmental and societal wellbeing

(Rasmussen et al.2021; SANBI, 2014). These services are grouped into four (4) broad categories: (Kotze et al. 2020; Logsdon and Chaubey, 2013)

1. Provisioning services: the direct and indirect benefits (goods and services) humans derive from the environment such as water from rivers and streams for domestic use and wood for fuel.
2. Regulating services: the benefits of natural ecosystem processes that regulate the environment and indirectly benefit humans and the environment. This includes for example, the regulation of the climate through processes such as carbon storage, and water quality enhancement and storage by wetlands.
3. Cultural ecosystem services: the indirect benefits that humans obtain from nature that society and the economy subsequently benefit from. This can include aesthetic beauty of landscapes or places of specific cultural significance.
4. Supporting services: the benefits that support the functioning of ecosystems, thus directly benefit the environment, and indirectly benefit humans. Examples include soil formation and pollination (refer to **Box 2**) (Kotze et al. 2020; Logsdon and Chaubey, 2013).

Box 2: Definition of ecosystem services:

Ecosystem services refers to the natural benefits that natural resources such as wetlands and rivers, provide to humans and the environment which contributes to their overall wellbeing. Over the past 20 years, the concept of ecosystem services has gained increased attention within literature and has created awareness in society of the impact of harmful human activities on the environment, and subsequently the loss of indirect and direct benefits from ecosystems. Through this understanding, humans are now exploring sustainable land use practices that can be implemented to ensure the protection of ecosystem services (Kotze et al. 2020; Logsdon and Chaubey, 2013).

Ecological infrastructure can also work in conjunction with built infrastructure to deliver vital ecosystem services to society and businesses reliant on natural resources such as water (SANBI, 2014; Browder et al. 2019). An example of such is the case of the Volkswagen production plant in Mexico. The plant relies on groundwater and rainfall as a main water supply for cooling machinery. However, the Puebla-Tlaxcala Valley in which the production plant is located faces a water risk issue attributed to population and industrial growth in the city of Puebla and subsequently an overreliance on groundwater as the main source of drinking water. To address this water security risk, Volkswagen collaborated with Mexico's national park service to implement ecological infrastructure interventions such as revegetating areas with the Hartweg's pines (plants that are indigenous to Mexico), earthen dams and soakaways to retain water. Through these interventions, the 2013 Volkswagen sustainability report, highlighted that 4 million cubic meters of water annually were being retained and replenished the aquifer, subsequently improving the level of water security in the city. Additionally, interventions such as replanting of trees contributed reducing carbon levels in the environment and restoring biodiversity within the city (Scott et al. 2018).

The benefits provided by our ecological infrastructure are the fundamental basis on which our economy and society functions, thus our reliance should not solely be on built or hard infrastructure for the supply of adequate water quality and quantity alone but also on natural infrastructure. Kotze et al. (2020) and Petersen et al. (2020) emphasise that the investment in well maintained natural EI

ultimately increases the lifespan of built infrastructure thereby contributing to water security (quality and quantity) well into the future.

Despite the various local, national, and international policies that exist which support investment in EI, within the South African context, there is still little buy in from the private sector. When comparing investment by the public sector, the investment in built infrastructure is higher than for EI. One factor contributing to this, is the failure to measure and capture the socio-economic benefits associated with EI investments. This is crucial when trying to garner support from both the public and private sectors. Often the investment in EI by either of the sectors, would be in areas beyond the sectors area of operation i.e. far afield; and thus, the benefits stemming from the investment may not be directly derived (Petersen et al. 2020), e.g. the removal of alien invasive plant species in the upper catchment area may not be perceived as being beneficial to an investor quite far downstream from the site, even though water availability may increase within the system.

Generally, a large percentage of South Africa's EI is in rural areas. The investment in the maintenance and restoration of EI in rural areas, would both contribute towards the safeguarding of the water resources but also be an indirect investment in ensuring the sustained livelihoods of people based in rural communities. EI interventions could create jobs during and after the implementation process, which could contribute towards the local economy in these rural areas. These jobs include *inter alia* labour-intensive activities such as alien vegetation clearing, revegetation of indigenous plant species and monitoring (SANBI, 2014).

Box 3: Definition of an EI investment:

Ecological infrastructure investment broadly refers to the actions or activities undertaken through financial input to restore, rehabilitate or maintain the ecological health of an ecosystem (Turpie et al. 2014).

A 2-year study was conducted by a transdisciplinary group of researchers from the University of Cape Town, Stellenbosch, KZN, and Copenhagen, on a project called "Socio-Economic Benefits of Investing in Ecological Infrastructure" (SEBEI). The project was aimed at investigating the socio-economic and water-related benefits of EI investments in six (6) areas located in the Berg-Breede and uMngeni catchments (Rebelo and Methner, 2019). The SEBEI project aimed to create an empirical evidence base through the analysis and documentation of the socio-economic and water-related benefits of EI investment within these six (6) studies areas. An outcome of the study found that a motivator of EI investment by investors and implementers, could be the contribution to job creation and thereby, improvement of livelihoods. In addition, investors and implementors also noted that EI investment was driven by policy regulations underpinning EI investment and business benefits, such as meeting the objectives of the corporate social responsibility (CSR) and the benefits of ecosystem services (Robelo and Methner, 2019).

The Ecological Infrastructure for Water Security Project

The Ecological Infrastructure for Water Security (EI4WS) project is a South African National Biodiversity Institute (SANBI) led project, focused on unlocking financing opportunities to conserve, restore, and rehabilitate ecological infrastructure for water security in the two major water provisioning catchments in South Africa - namely the Berg-Breede and uMngeni catchments. The overall project aims to highlight the critical role EI plays in ensuring water security, through documenting and synthesizing information (SANBI, 2021).

In the area of high-level policy and finance, a great deal of work has been done and still ongoing through the EI4WS project. A few examples of this are "developing natural capital accounts; influencing applicable policy frameworks, regulatory instruments and institutions; and supporting the operationalization of mechanisms for financing ongoing rehabilitation and maintenance of biodiversity and ecosystem services" (SANBI, 2018: page iii). "Work with national and sub-national level stakeholders to strengthen the enabling environment" (SANBI, 2018: page iii). Furthermore, high-level engagement and consultation with Development Finance Institutions (DFIs) and the private sector have been extensive and ongoing. As an illustration, the following were found during this work: (1) Business stakeholders who are critical to the objectives of the EI4WS project; and (2) the body of evidence, the modes of communication, and the business community's support would necessitate actively participating in the EI4WS project and encouraging its adoption (NBI, 2019). Additionally, a great deal of national (NBI, 2019; SANBI, 2018), regional (Sustainable Finance Landscape Coalition, 2022), and global (UN Water, 2018) discussions have already taken place regarding the main facilitators and obstacles to mainstreaming ecological infrastructure into infrastructure planning, financing, and development for better water security.

However, what seems to be lacking is documentation of how well some of these key concepts and policies are being translated into sustained financial/human resource flows resulting in tangible outputs and outcomes at individual local sites in South Africa. Any concept or policy is only as good as how it ultimately becomes operationalised on the ground. Thus, it is critical to understand for specific sites how the different role-players (often including the private, public, and volunteer sectors) have walked a path together with its own specific barriers and enablers and what key lessons can be learnt from their experience. In particular, how were the role-players able to learn from/build upon/innovate around both their successes and failures. How did this build resilience to for example to impacts of climate change (wildfires, extreme weather such as coastal storm surges and political events such as the KZN unrest in 2021). It is principally at this level of the individual initiatives where the current project will seek to contribute to the larger EI4WS initiative. By aiming to “dig deep” into how the implemented initiatives were able (or not) to achieve positive EI4WS outcomes, it is anticipated that more fertile material will be provided on which to build a framework which has practical value to potential users.

The Concepts of EI and Investment

The degradation and/or loss of our natural resources/EI, especially freshwater ecosystems, has been well documented (Van Deventer et al. 2020; Nel et al. 2011). Much of the loss can be attributed to anthropogenic activities including *inter alia*, urbanisation, draining of wetlands for agricultural purposes and/or encroachment of alien invasive plant species. With the continued deterioration of ecological infrastructure there has been a growing need for EI interventions aimed at protecting, conserving, and/or restoring these ecosystems and the associated services they provide. Securing EI can be undertaken in a suite of mechanisms including *inter alia* the protection through formal channels/mechanisms, and/or the rehabilitation/restoration of degraded systems, or even creating ecosystems to serve a specific purpose e.g. created wetland habitat for water quality enhancement. These mechanisms can all contribute towards increasing the resilience of these systems especially against issues such as climate change, droughts, and floods. However, Rebelo et al. (2021) notes that the benefits of EI interventions are context specific, given the diverse range of ecosystems globally.

Thus, implementing EI interventions that are context specific is critical in deriving the optimal benefits from it.

In terms of this study, the investment in EI specifically refers to a range of financing or funding mechanisms that contribute to water security, even though EI investment at a broader scale may include biodiversity conservation, carbon sequestration etc. EI investment refers to the maintenance of functioning EI and restoration of degraded EI through financial input, time, effort, and decision making that supports preservation, restoration, or maintenance of EI (OCED, 2022; Turpie et al. 2014). For example, EI 'funding' is used broadly and includes sources of capital where a repayment of the capital is not required (e.g. a grant) and where capital is provided with the expectation of repayment and, typically, a financial return or 'cost' in the form of interest or dividends (e.g. a loan). The latter is usually referred to as 'financing' in contrast to funding (OECD, 2022).

Box 4: Definition of an Ecological Infrastructure Intervention (EI):

An EI intervention is an activity that can include a suite of activities aimed at improving the functioning of natural ecosystems, informed by environmental knowledge (Mbopha et al. 2021; Rebelo and Methner, 2019).

EI investment can take the form of a range of different approaches, examples include, wetland rehabilitation, incorporation of EI into decision making through leveraging existing policies such as the Task Force on Climate Related Disclosures (TFCD) which encourages companies to be transparent about their role in mitigating the effects of climate change thus can potentially motivate companies to invest in EI, maintenance of natural vegetated buffers around freshwater ecosystems, and maintaining or protection of conservation areas (SANBI, 2014).

THE OUTCOMES/BENEFITS OF INVESTING IN EI

The intended aim of EI investment is to restore or maintain the natural functioning of ecosystems, so they can provide the ecosystem services essential for human and environmental wellbeing (Jewitt et al. 2020). This investment can take different forms, depending on the required intervention of a specific ecosystem and context in which the intervention is being implemented. This section provides a summary of the socio-economic and environmental benefits of investing in EI from a rural and urban perspective.

Water is an essential component of economic development, as all sectors ranging from agriculture to technology and energy generation, rely on it for aspects of the production process (United Nations, 2018). The combination of different elements within the catchments plays a fundamental role in terms of water quality enhancement, streamflow regulation and flood attenuation. For example, wetlands act as sponges in which these systems are able to assist in the spreading out of floodwaters across the wetland, reducing the severity of the floods downstream but also retain flows within the system for extended periods and slowly releasing flows during low flow periods. The efficacy at which these systems supply these regulating services is greatly increased when the broader catchment area is also in a relatively good condition. Intact EI can assist in disaster risk reduction and prevention. Thus, the investment in EI through maintenance or restoration of ecosystems can contribute to improving water quality, reducing flood risks which can potentially threaten human life and ecosystem health, preserve the functioning of built infrastructure, and save maintenance/repair costs (SANBI, 2014). Additionally, benefits of investing in EI restoration and maintenance contributes towards food security, as crop production is directly related to soil health and stability. This is particularly important within rural areas, as there is a large reliance on natural resources for livelihoods.

Furthermore, investment in EI also supports climate change adaptions, which rely on EI to absorb climate change related activities including floods, droughts and serve as carbon sinks. For example, South Africa has an abundance of peat-containing wetlands that are considered as one of the most effective carbon sinks globally, as they are able to store large amounts of carbon over long periods of time (SANBI, 2014). The combination of investment in EI and maintenance of built infrastructure should be prioritised in South Africa, as many of the factors that contribute to socio economic development, societal and environmental well-being are dependent on well-functioning ecosystems/EI (SANBI, 2014).

Benefits of Ecological Infrastructure Investment

The rate of urbanisation and subsequently population growth within Africa is expected to double by 2050. This poses a serious threat to important natural habitats within cities such as forests, which provide regulating and provisioning ecosystem services for the wellbeing of the natural environment and people, which face the risk of being cleared due to urban sprawl. For example, forests act as carbon sinks, which contributes positively to climate mitigation but also regulates water flow through minimising runoff and thus soil erosion. Taking this into account, the continued loss of natural habitats and subsequently ecosystem services within urban areas, results in increased pressure due to expanding populations on existing built infrastructure to deliver the growing demand of ecosystem services and service delivery (Gulati and Scholtz, 2020). According to Gulati and Scholtz (2020) cities experiencing rapid rates of urbanisation and population growth are regarded as the most vulnerable to climate change events such as drought and floods, as the urbanisation often expands to vulnerable

areas such as wetlands and floodplains. This decreases the resilience of the ecosystems against flood and erosion control, subsequently posing a threat to human life and built infrastructure (SANBI, 2014) e.g. the KZN floods of 2022.

The April 2022 floods which took place in KwaZulu-Natal (KZN) are an exemplary case of the effects of climate change related weather events to urban and peri-urban areas, that have developed rapidly whilst failing to enhance the ability of built infrastructure and natural EI to absorb and manage the effects of urban sprawl and climate change related weather events. To substantiate this, an article by Naidoo (2024) attributed the severe impact of flooding on 1) human and economic wellbeing within the city of Durban to 2) poor urban planning incorporating climate related risks, 3) the development of settlements in vulnerable areas such as floodplains, 4) poor land use practices, 5) poor maintenance of built infrastructure, 6) increase in invasive alien vegetation and 7) the overall degradation of EI. A description of the financial implications of the 2022 floods is provided in **Section 9.2**. Magidimisha-chipungu (2024) notes that extreme rainfall events attributed to climate change are expected to continue and worsen in South Africa, thus urgent approaches such as the implementation of green EI interventions are required to increase flood resilience with urban communities. Magidimisha-chipungu (2024) notes that the implementation of green EI interventions such as green roofs, recreational areas (parks), permeable pavements and the preservation of natural EI within Durban, can play a crucial role in mitigating the impacts of floods within Durban thus subsequently mitigating the impacts of climate change.

It is within this context that ecological infrastructure is thus explored as a potential solution to address challenges related to increased demand for water and sanitation services, ecosystem services and climate resilience within the urban environment. Ecological and green infrastructure interventions vary according to the context in which they are implemented, the issue that is being addressed, and are intended to increase the climate resilience of cities and reduce the extent of environmental impacts driven by urbanisation. Examples of interventions include *inter alia*, removal of alien invasive plants, replanting of indigenous vegetation in degraded areas, rainwater harvesting, development of roof gardens or 'green roofs', restoration and rehabilitation of rivers and wetlands, and creating 'green spaces' such as parks or gardens within cities. Through these interventions, the longevity of built infrastructure increases, as less pressure is placed on it to meet the increasing demands.

Green infrastructure is implemented in urban or peri-urban areas as an effort to increase the resilience of cities against climate change and meet the growing demand of ecosystem services (Pitman et al. 2015). Green EI provides a range of ecosystem services that are essential for human socio-economic wellbeing, inter alia:

- **Regulation or urban temperatures:** The development of 'green spaces' such as establishment of parks and planting of trees play a significant role of reducing temperatures within urban areas, thus reducing the urban heat island effect. This is important as African cities often lack capacity to generate energy to deliver electricity into communities. According to Pitman et al (2015) increased temperatures pose a serious threat to the health of human beings due to 'heatwaves' particularly for older people.
- **Enhanced water quality and supply:** Green EI enhances water supply and quality, subsequently increasing water security through the conservation of natural EI such as rivers, aquifers, and the purification of water by wetlands. Considering the challenge of drought

facing southern Africa, these ecosystem services are particularly important to meet the growing demand of water availability and quality within African cities.

- **Improved stormwater management and flood protection:** With the increase in urbanisation, African cities are becoming a 'concrete jungle', which poses a challenge to water management, particularly stormwater. The development of green roofs, permeable pavements and recreation parks act as surface water drainage points, which decrease the accumulation of water within urban areas, which subsequently prevents flooding.
- **Improved air quality:** To meet the growing demand of transportation within African cities, transportation infrastructure is being developed. However, this increases air pollution posing a threat to human health. The planting of trees contributes to improving air quality in urban areas as trees are able to absorb gaseous pollutants such as sulphur dioxide thus purifying the air.

Investment in green infrastructure also provides a range of direct and indirect economic and social benefits which includes:

- **Job creation and improved livelihoods:** The implementation of green infrastructure interventions within urban areas, which entails designing, planning, and maintaining green EI interventions provides employment opportunities, particularly for the urban poor.
- **Increase in tourism and investor interest:** Through investment in green EI, urban areas become more aesthetically appealing, which attracts tourism and investor interest, thus boosting economic growth and providing job opportunities. Additionally, properties around green EI interventions are likely to increase in value which provides a higher return on investment for homeowners.
- **Improved human wellbeing and social cohesion:** The development of green spaces such as parks can potentially help humans improve their physical and mental health through exercising and mental stimulation attributed to nature. According to Gulati and Scholtz (2020, p. 15) "green spaces have been proven to increase physical activity and reduce blood pressure, the risk of a stroke, cardiovascular disease, obesity and the level of stress in residents who have better access to these spaces." This can reduce healthcare costs for individuals and pressure on public health facilities. Furthermore, green spaces provide areas for communities to interact and establish relationships, which is a crucial factor in building trust within communities. This is particularly important for low-income areas, where most of the community spends time within their neighbourhood. A study conducted in the Netherlands, found that the establishment of green spaces, allowed community members to interact more frequently, thus increased the level of social cohesion. These developed feelings of trust, belonging and inclusiveness amongst community members.

Integrating Green and Grey Infrastructure

Investment in and maintenance of EI can positively contribute towards the longevity and costs of maintaining built infrastructure, through lessening the burden on the said infrastructure (Browder et al. 2019). An example thereof is the Quito Water Fund (Fondo para la Protecion del Aua, FONAG), established in 2000 supported by TNC. The Quito Water Fund is a financial tool in Latin America, which redirects funding from water user payments into water conservation with the aim of ensuring water security for the residents of Quinto by preserving the watershed area. The Quinto area has a three (3) decade history of water insecurity, primarily due to a rapidly growing population. Additionally,

infrastructure development linked to urbanization, deforestation, and land degradation attributed to poor land use and grazing practices, threatens the key water source area of the Quito community, which are the reserves in the Andean Mountains. The abovementioned threats put the ecological integrity of critical ecosystem functions within the reserve at risk, degrades the water quality and threatens the state of sustainable water security in the future especially with the challenge of water delivery in the area through built EI (Browder et al. 2019).

FONAG implements a range of activities that are intended to improve and preserve the functioning of the reserves, including revegetation of degraded areas with indigenous plant species, riparian fencing, limiting the grazing of cattle, and environmental education in the communities. Through these conservation efforts, an estimated 33 000 hectares within the reserve have been protected and 25 000 hectares of degraded land has been restored (Browder et al. 2019). The Quito Water Fund provides a prime example of the role maintained natural EI can play in ensuring water security, particularly when built EI is unable to meet the water availability demand of a growing population, as was the case for the Quito area (Browder et al. 2019).

Therefore, investment in EI should be recognised as a strategic way to minimise risks and to preserve the ecological integrity of ecological infrastructure which subsequently contributes to human wellbeing through the provisioning of essential ecosystem services e.g. water quality enhancement.

ROLE PLAYERS POTENTIALLY INFLUENCING EI INVESTMENT

A review of international literature by Mbopha et al. (2021) highlighted a range of drivers that motivate government and private sector (private commercial companies, non-profit organisations, and occasionally civil society members) to invest in EI. Amongst the biggest drivers of investments internationally are the need to conserve biodiversity, and to mitigate the effects of agricultural intensification. The review further emphasized that the main motive for investment by governments is sustainability and identified that government is the leading investors in EI to address all drivers/needs categories. For the private sector, the main motive is social responsibility (Mbopha et al. 2021). Delivery of ecosystem services (provisioning, regulatory, cultural and support services) to enhance livelihoods is also a key driver of investment, as are adapting to and mitigating the effects of climate change, and water resource protection. However, a business-needs analysis report conducted by the NBI (2019), which assesses the motivators that encourage private sector to invest in EI, notes that despite corporate social responsibility being one of the driving factors motivating private sector to invest in EI, this provides a limited view. The report highlights that factors such as company reputation and risk management practices should be considered driving factors that influence EI investment by companies (NBI, 2019).

There is significant variation in approaches to motivate and incentivise EI investment. Mbopha et al. (2021) states that policy implementation, management, political support, self-directed environmental awareness, and support to advocate by NGOs generally motivated public institutions and private landowners to invest in EI. Public policies that emphasise regulatory enforcement and compliance also effectively compel landowners to implement EI interventions. Incentive programmes, such as the subsidies programme, are also effective in stimulating EI conservation and rehabilitation on private farmlands. Public–private partnerships (PPP) were identified as effective cooperative mechanisms to mobilise funding for public goods and services. Globally, PPPs have increased rapidly, becoming key mechanisms for encouraging private sector investments in EI. However, Mbopha et al. (2021) highlight that globally the current role and commitment of the private sector in long-term PPP arrangements for EI investment is still insignificant, and that this is particularly the case in developing countries.

A key finding was that incentive-based policies are critical in encouraging the willingness of private landowners to participate in EI programmes, particularly when there are effective compensation measures in place. Governments typically provide financial incentives and funding to private landowners. Market-based conservation instruments (e.g. conservation banks) have also been formed as an approach to encourage EI protection while supporting ecosystem goods and services delivery, economic growth, and development (Mbopha et al. 2021).

Conservation ethics and values were highlighted as non-economic motivators for EI management and rehabilitation, particularly among the private sector, for example, where socio-economic conditions are favourable (i.e. land rights, land ownership and tenure security), private landowners are more likely to conserve EI. Furthermore, economic-based instruments that offer incentives is influential in stimulating willingness to invest in EI, but these need to be supported by regulatory approaches that aim to protect the EI (Mbopha et al. 2021).

In South Africa, the public sector/government has played a leading role in lobbying for and investing in EI. This was largely driven by the perception that the public sector were the main beneficiaries of EI investment. Owing to this, the private sector did not often experience a direct return on investment,

where EI investment is concerned. Moreover, developing countries like South Africa are limited in their contribution to EI investment, whether it is through financial input or capacity, primarily due to the requirement of funding criteria which focus on meeting employment objectives with an effort to alleviate poverty. This criterion limits how funding can be applied within EI projects, however, the emphasis of involving the private sector in EI investment has gained considerable attention over the years (SANBI, 2014; Robelo et al. 2011). **Section 9.2** is an example of a South African EI project with a funding model that prioritises socio-economic development through job creation. It is evident from this case study that the management/rehabilitation of EI is enhanced through investment by a diversity of stakeholders. This includes entities from public (e.g. local/national government, etc.), the private sectors (e.g. businesses, etc.), and civil society (community-based organisations, NGOs, etc.).

As noted by Rasmussen et al. (2021) and Robelo et al. (2011) there has been a lack of observed or measurable evidence of the socio-economic and ecological benefits derived from EI investment within the uMngeni, Berg and Breede catchments, despite there being extensive EI investment over the years within these catchments. This is attributed to the fact that more emphasis is placed on the short-term employment and environmental benefits (related to water quality and ecosystem services), provided by short-term EI projects within the initial implementation phase of the project. However, limited evidence exists of the long-term socio-economic and environmental benefits of EI investment (Rebelo et al. 2021). It is within this context that an evidence-base providing an account of the outcomes of EI investment through monitoring and evaluation (before and after project implementation) is recommended as a catalyst to attract and influence investment in EI, from private sector. Furthermore, the benefits of EI investment are likely to vary across different contexts, due to the diversity of ecosystems. Thus, the outcomes of EI investment, cannot be generalised and assumed as similar across ecosystems. This further emphasises the need for context specific evaluation of EI projects throughout the project duration to enable the collection of baseline and on-going monitoring data which will ensure that unique project outcomes are recognised (Rasmussen et al. 2021). This will allow for a more detailed evidence base to be built to identify the socio-economic and ecological benefits of EI interventions, thereby potentially leveraging more investment in EI intervention.

In addition, the study recommended that government make provision for applied and focused research, to build a detailed evidence base of the benefits of EI intervention. Although the evidence of socio-economic benefits of EI investment, and subsequently financial returns are crucial and similar for both the private and public sector investors, the private sector requires more detail meaning, the socio-economic and ecological benefits and outcomes of the EI intervention should be explicit to elicit funding from the private sector. Despite there being significant public sector investment in EI interventions in South Africa, the value of the investment, is considered little when compared to what is required. The study also found that private sector investment could play a critical role in upscaling EI intervention, which still requires evidence (Rebelo et al. 2021).

The investment from the private sector into EI, can be garnered through emphasising the value provided by ecosystem services to the sector, such as access to clean water. Clean water is a provisioning service that well-functioning EI can contribute towards and is often a raw material to the production process of many businesses. Raising awareness to this invaluable benefit to business owners or shareholders, could motivate businesses to take an active role in conserving and protecting resources that provide clean water, and subsequently EI (WBG, 2020). Additionally, private sector can invest in EI as a way of reducing the risk of climate change related challenges, such as floods and

drought that can hamper the production process of businesses. Businesses have started to include this within their risk management strategies. Lastly, investment in EI can provide job opportunities and a healthy and sustainable environment for adjacent communities, which aligns with the objectives of businesses who aim to improve their societal and environmental impact through the social responsibility agenda. Government can also play a more active role in encouraging private sector investment in EI. This can be through incentives, enactment of new regulations pertaining to EI investment and/or grants which encourage private sector investment (SANBI, 2014). Internationally, business/environmental certification can motivate businesses to invest. An example of such regulations is the ISO 14001 international environmental standard, which many businesses are moving towards as there is a growing requirement of Environmental, Social and Governance (ESG) practices. The ISO 14001 standard provides an environmental framework for businesses to manage, monitor and improve their environmental practices (NBI, 2019).

At a local level, the management and maintenance of EI is shared across all levels of government in South Africa. The active participation of civil society in water management and stewardship is encouraged and has continued to be enabled by national policy. An example of such is the Integrated Water Quality Management (IWQM) policy, which was established as a bottom-up, which involves civil society in the water-related decision-making process, in an effort to address water quality challenges in South Africa (Boyd et al. 2011). IWQM is centred on the notion that all water users (businesses, government and civil) are responsible for managing and responding to water quality challenges (Boyd et al. 2011).However, civil society can play a more active role in supporting EI investment, through planning, participating in various stages of the EI intervention such as monitoring and evaluation or through capacity for implementation (SANBI, 2014).

There are a range of national policies that align with investment in EI, including *inter alia*, the National Development Plan 2030, The New Growth Path, the National Infrastructure Plan, and the Climate Change White Paper. With South Africa being a developing country facing a suite of challenges including unemployment, poverty and inequality, investment in EI can contribute towards addressing some of these issues, through job creation and rural development (SANBI, 2014). Furthermore, South Africa's National Water Act recognises the multiple benefits that arise from healthy catchments with well-functioning ecological infrastructure. The Act, and associated raw water pricing strategy, provide for pricing instruments (charges) that can be used to invest in ecological infrastructure (van Zyl et al., 2022). This is particularly evident in the National Water and Sanitation Master Plan Call to Action (DWS, 2018): Objective 1.6 "Protection and restoring ecological infrastructure", with Key Action 1.6.4 specifying the need to "secure funds for restoration and ongoing maintenance of EI through operationalising the water pricing strategy".

The National Development Plan

The National Development Plan (NDP) 2030 is the guiding document for national development which aims to reduce inequality and alleviate poverty in South Africa through economic, social, and environmental development (NPC, 2022). The NDP uses a multifaceted framework with 20 guiding principles to achieve the 2030 goals. Goal 7 and 8, particularly align with EI investment. Action 7 implores for 10% of the country's Gross Domestic Product (GDP) to contribute to EI investment. A review was conducted in 2022, to assess the progress in meeting the NDP 2030 goals (specifically Action 7). The study highlighted that the set target for EI investment through GDP will likely not be met due to the public sector funding for EI, being below the required amount (NPC, 2022).

Furthermore, there is a need to mobilise private sector funding for EI investment, to enhance water, electricity, and transport infrastructure to sustainably support socio economic development (NPC, 2022).

South African New Growth Path

The South African New Growth Path is regarded as a framework which advances socio-economic development and justice (Fine, 2012). An important component of this agenda is investment in infrastructure, with a particular focus on the water sector. The National Infrastructure Plan, enacted in 2012, outlines a detailed national development plan to support socio -economic development through infrastructure development, which subsequently provides jobs and improved service delivery. Within this plan an amount of R827 billion rand was allocated to restoring, repairing, and building new EI (SANBI, 2014).

A review of the status of infrastructure finance and funding was conducted in 2021, which highlighted that an estimated R6 224 billion is required to meet the demands of infrastructure funding to support economic growth between 2016 and 2040 (DPWI, 2022). This financial requirement is attributed to the financial distress experienced by government and SOE budgets attributed to debt, mismanagement of funds and expenditure pressures. To address this financial gap, new financial mechanisms will need to be explored, and existing ones leveraged. An example of an existing financial mechanisms that can be leveraged upon is the public-private partnerships which can be useful in attracting private sector into EI investment (DPWI, 2022).

National Climate Change Response White Paper

The National Climate Change Response White Paper, which is a framework in South Africa aimed at addressing climate change mitigation and adaption. The guiding document supports ecosystem-based adaptations to address climate change associated risks and thus, supports the necessity of maintaining well-functioning EI to respond to climate change events (SANBI, 2014). There are various ways EI can be incorporated into South Africa's policies. These range from mainstreaming biodiversity to land use planning and biodiversity stewardship. An example of such is the working for wetlands programme (WfW) which is a collaborative effort between the DEFF, the Department of Human Settlements, Department of Water and Sanitation (DWS). The programme focuses on investing funding in conserving and rehabilitating wetlands, whilst supporting socio-economic development through job creation, capacity development of people and supporting small businesses (DEFF, 2021). Additionally, the project is well supported by the government and political structures who have a vested interest in the jobs that can be created in investing in EI. The biodiversity stewardship approach is a voluntary, partnership-based system that allows private and communal landowners to conserve biodiversity priority areas (DEFF, 2021). The biodiversity stewardship approach can be implemented as a tool to work with landowners who have valuable EI on their land and to encourage collaboration between public and private sector in EI management and investment.

As is evident, there are a suite of role players that can influence businesses/society to invest in EI, although some of the strategies/approaches may not always initially be welcomed due to them potentially being viewed as being an additional burden/requirement on the company.

The National Water Act and the Raw Water Pricing Strategy

The existing South African legislative framework provides the rationale and basis for securing "funds for restoration and ongoing maintenance of EI through operationalising the water pricing strategy" (DWS, 2018: Key Action 1.6.4) - clearly evident in the National Water and Sanitation Master Plan Call to Action and recent proposed revisions to the pricing strategy for raw water use charges. The water pricing strategy (revisions 2015, 2022) allows for proceeds from water charges to be invested in the 'maintenance and restoration of ecosystems' (DWS, 2015, 2022). The costs of activities associated with the conservation and rehabilitation of catchment EI to protect water resources and enhance water security have historically not been directly considered, or included, in water pricing and tariff setting which has focused on the 'supply cost' of water.

At present, opportunities exist draw on the Water Resource Management Charge, the Water Resource Development (Infrastructure) Charge and tariffs (bulk or retail) to fund EI conservation and rehabilitation activities (Audouin et al., 2021). Specifically, one of the activities that may be partially or completely funded from the **Water Resource Management Charge** is the "Maintenance and Restoration of Ecosystems to improve water resources" (DWS, 2022). The 2022 Draft National Pricing Strategy (DWS, 2022) proposes that **activities funded through the Water Resources Management Charge "will be progressively undertaken by CMAs**". The National Water Act (Act 36 of 1998) provides for the establishment of Catchment Management Agency (CMA) institutions to manage water resources at a regional or catchment scale in defined Water Management Areas (WMA)[9]. CMAs have been part of DWS planning since the National Water Act (NWA) of 1998, with the purpose of delegating water resource management to the regional or catchment level and to involve local communities. The establishment of CMAs has faced a number of significant challenges and only two of nine proposed CMAs have been established and are functioning: the Inkomati Usuthu Catchment Management Agency (IUCMA) and the Breede Gouritz Catchment Management Agency (BGCMA). While the Pongola-Umzimkulu Water Management Area, which largely coincides with the KZN province, is not yet in place, it has an active proto-CMA driven by the KZN DWS regional office.

Of particular relevance to this study, Munnik (2020) noted that revenue collection, by the National Department, for water resource management has not been effective, quoted at around 60% (2018). Munnik (2020:23), suggests that CMAs "have a much better chance of collecting revenue as they are in contact with water users who need to pay, and have an immediate interest in collecting the money". On the other hand, the wide-ranging mandate of a CMA and the large size of some of the WMAs, such as the Pongola-Umzimkulu Water Management Area, means that a CMA may not be the most suitable entity for coordinating and managing EI investment at the catchment scale.

Interestingly, from the research undertaken, Munnik (2020) identified one of the consequences of the delayed establishment of CMAs is that other organisations have stepped in to fill the role of the CMAs. Examples given include the other government departments (water quality monitoring), irrigation boards (investment in EI, water quality monitoring) and NPOs. However, Munnik (2020) suggests this is not necessarily sustainable, due to limitations in the resources and mandates of these organisations.

[9] Water Management Area is a management unit defined by the Act and consists of a number of catchments. In the 2004 National Water Resource Strategy, 19 WMAs were defined, these were subsequently consolidated into nine WMAs, which were gazetted in 2016.

Where well-functioning EI protects or extends the life of built infrastructure (e.g., dams and treatment works), the costs of maintaining or enhancing EI can defensibly be included in the **Water Resource Development (Infrastructure) Charge** (i.e., in the operational and maintenance costs of built infrastructure). Furthermore, regional water utilities (through water tariffs), are arguably obliged to support the effective functioning of EI as part of the sustainable delivery of water services (e.g., disaster risk mitigation).

The **Water Discharge Charge** has been proposed as an additional water charge specifically intended to facilitate the recovery of costs associated with mitigation and abatement measures employed in a water resource to achieve water quality objectives. It is intended that the Waste Discharge Charge System, if properly implemented and managed, will encourage those discharging waste into water resources to reduce waste and to use water resources in a more sustainable manner, through for example, abatement of pollution at source, recycling of waste streams and wastewater, and re-use of water. The proposed charge is focused specifically on the recovery and disbursement of quantifiable costs incurred in the mitigation of direct impacts of waste discharge. As a potential source of funds for EI investment, EI maintenance and enhancement activities would have to be clearly linked to the mitigation of direct impacts of waste discharge. The Water Discharge Charge System is not currently levied and is in the pilot phase of development (with pilots in the Crocodile, Olifants and Vaal WMAs). Its potential as a funding source for EI conservation and rehabilitation requires further analysis informed by the findings of the pilots and the practical implementation of the charge. However, implementation of the waste discharge charge could incentivize water users (discharges of waste) to invest in EI infrastructure that reduces their contribution (load) of pollutants of concern to the water resources (e.g., wetland rehabilitation/construction and nutrient load reduction).

Water charges and tariffs have the potential to contribute to a portion of the costs of implementing EI projects. A key strength in this regard is that water charges provide a dependable flow of funds, which supports longer term initiatives to maintain and enhance EI and allows for a longer-term planning approach. van Zyl et al. (2022) suggest that the funds generated from these various charges are particularly suited to the ongoing maintenance of EI, rather than providing large up-front capital investments. However, funds generated through water charges could also support the servicing of loans for capital investment (van Zyl et al., 2022). The NBI (2019:17) makes a similar finding, suggesting that the value of water charges and levies could be increased through a 'blended finance' approach, whereby funds generated through water charges and levies could be combined with other funding sources "ultimately allowing for a greater level of investment". The importance of the reliability of the flow of funds fromwater charges is emphasised by the NBI (2019:17) "As soon as you have a reliable revenue stream (in this case, a municipal or Water Board levy, or indeed a catchment management charge levied at a national level), it is possible to raise additional loans, as well as crowd in new investors and grant money, such that the available capital for investment in EI4WS projects is much greater". The pooling of funds from different sources (e.g., government grants, levies, and debt finance) is commonly referred to as blended finance (NBI, 2019).

Table 9-1 provides an overview of the five raw water charge categories. As an example, the table also shows the unit charges applied in the uMngeni-uMkhomazi catchments (2019/20 year) and presents indicative potential funds (for one year) that could be generated from the raw water charges, if fully collected, associated with water use in the uMngeni-uMkhomazi based on an analysis of the registered

water use volumes (from the DWS Water Use Authorisation and Registration Management System (WARMS) database) for November 2019 to October 2020[10].

Table 9-1 Overview of the five raw water charge categories

Description[11]	uMngeni-uMkhomazi charges (2019/20)[12]
Water Resource Management Charge Levied to generate funds for water resource management activities in each of the WMAs. Activities relate to the protection, allocation, conservation, management and control of the nation's water resources, which may be partially or completely funded from the WRMC. Composed of the abstraction water use charge and the waste discharge related water use charge. Applies to all water use categories except Hydropower. Levied by CMAs/DWS regional.	Agriculture: R0.018/m^3. Domestic & Industry (D&I): R0.026/m^3. Streamflow Reduction Activities: R0.014/m^3. Indicative potential annual funds generated (2019/20): R17 392 896.
Water Resources Infrastructure Charge Levied to cover costs relating to the development and use of waterworks, which may include the investigation, planning, design and construction and pre-financing of water schemes. Four components: operations and maintenance, depreciation/refurbishment, Future Infrastructure Build Charge (FIBC), and the Capital Unit Charge (CUC). All components, except the FIBC, are scheme specific and, therefore, the charge will vary. TCTA raises loans to finance the development of new water resource infrastructure. The CUC is specifically used to cover the capital interest costs paid to private financiers. Applies to all water use categories except Stream Flow Reduction Activities. Usually levied by TCTA/Water Boards.	Scheme: R0.431/m^3 (no scheme charges listed for the uMkhomazi catchment for 2019/20). Indicative potebtial annual funds generated (2019/20): R202 778 401.
Water Research Levy (Water Research Commission (WRC) Charge) Used to fund water-centred Research and Development for South Africa (through the Water Research Commission). Currently applies to all water use sectors except Stream Flow Reduction Activities and Hydropower (to be reviewed in the near future). Resource-poor farmers are exempt from paying the water research levy. Collected by DWS/Water Boards on behalf of the WRC.	Agriculture: R0.002/m^3. D&I: R0.067/m^3. Indicative potential annual funds generated (2019/20): R37 900 499.
Waste Discharge Charge (mitigation charge) *A proposed charge (pilot phase) – not currently levied.* Intended to facilitate the recovery of costs associated with mitigation and abatement measures employed in the water resource to achieve water quality objectives. May be applied to all discharges contributing to the load in an upstream catchment where downstream resource quality objectives are threatened or exceeded, even where incremental upstream resource quality objectives are met. Intended as a user charge and, therefore, more suitable for point source discharge, whereas erosion and the generation of sediment is typically non-point source (quantification challenge).	*No current charge.*
Economic Regulator Charge	

[10] Part of a study undertaken for Umgeni Water.
[11] DWS (Department of Water and Sanitation). 2022.
[12] DWS (Department of Water and Sanitation). 2019.

Description[11]	**uMngeni-uMkhomazi charges (2019/20)**[12]
A proposed charge – not currently levied. Intended to fund activities of the Economic Regulator, which has a critical role in all aspects of the water value chain. Will only be implemented once the necessary legislation provides for such charges.	*No current charge.*

EXISTING GUIDELINES AND PROGRAMMES SUPPORTING EI INVESTMENT

The following section provides a summary of some existing guidelines and programmes that have contributed towards EI investment mainly within South Africa.

Water Funds

Globally, one of the most widely applied frameworks for promoting investment in aquatic EI is the "Water Funds" programme of The Nature Conservancy, for which practical guidelines are available to equip practitioners with step-by-step guidance to the Water Funds Project Cycle (TNC, 2018). It has particular application where EI investment is being undertaken on a large scale by a city in its upstream water supply catchments, typically involving a large number of partners and multiple major funders. The programme has had over three decades of development and refinement through practical application and includes a well-established South African example the "Greater Cape Town Water Fund" (described in Error! Reference source not found.).

Water Funds have a standardized development process around a five-phased cycle (**Table 9-2**), for which guidance is provided through the Water Funds' many online resources, including the Water Fund Field Guide (TNC 2018). The TNC (2018) guidelines also elaborate on five areas of action (**Table 9-3**) that are common to all Water Funds, although recognizing that each Water Fund will differ somewhat based on local conditions and context. In the case of the Greater Cape Town Water Fund, a comprehensive monitoring and evaluation program tracks the impacts of implementation efforts focussed on clearing invasive alien plants. In addition to water reclamation benefits, biodiversity and socio-economic outcomes are monitored, and the efficacy and cost effectiveness of different control methods are compared for ongoing strategy refinement. An online Decision Support System plays a central role in tracking progress against targets, guiding operational planning and fostering alignment amongst the implementing partners (TNC, 2022).

Table 9-2 The five-phased cycle around which the Water Fund development process has been standardised (adapted from TNC 2018)

1. Feasibility	2. Design	3. Creation	4. Operation	5. Maturity
Step 1.1 Eligibility Screening Checklist Step 1.2 Situation Analysis Report Step 1.3 Decision Support Document Step 1.4 Gain Formal Commitments & Hire WF Director	Step 2.1 Formalize WF Board & Develop Charter Step 2.2 Start Creation of Legal Mechanism Step 2.3 Update Situation Analysis Step 2.4 Water Fund Strategic Plan Step 2.5 Design Studies • Portfolio of Interventions • Social Impact Assessment • Business Case • Long-term Finance Step 2.6 Monitoring & Evaluation Step 2.7 Pilot Projects	Step 3.1 WF Legal Mechanism Established Step 3.2 Create first Annual Operating Plan Step 3.3 Operational Management Readiness Step 3.4 Launch Event	Step 4.1 Annual Operating Plan Step 4.2 Reporting Step 4.3 Adaptive Management	Maturity Criteria ✓ Significant % of long-term financing committed ✓ Routine reporting that documents WF's ongoing impact ✓ Influence demonstrated ✓ Positive public perception demonstrated ✓

Table 9-3 Areas of action common to all Water Funds (from TNC, 2018 p. 12-13)

Area of Action	Strategic Purpose	Examples of Action	Examples of Deliverables
Governance	Assembling and aligning stakeholders with political influence and societal trust that bring credibility to the Water Fund and helps the institution initiate interventions. This includes stakeholders from the private companies, academia, civil society, and the public sector all engaging at different levels of participation with the Water Fund (some as partners, some as promoters and some as allies). Work in this area is focused primarily on the Water Fund's initial set-up but may also be necessary in the early phases of interventions to assemble/organise relevant stakeholder support for these initiatives.	1. Convene stakeholders to establish credibility. 2. Establish decision-making rules and governance structures. 3. Establish the Water Fund's legal mechanism.	• Stakeholder map/analysis. • Water Fund Charter (or similar agreements). • WF established as a new Legal Entity or hosted in an existing Entity.
Science	To build the case for the Water Fund through scientific analysis and build credibility through monitoring and evaluation of interventions.	1. Make decisions based on science: identify problems and optimize a portfolio of interventions to help address them. 2. Monitor interventions to demonstrate impact. 3. Incorporate monitoring results into decision-making and adapt operations.	• Water Balance Model • Portfolio of Interventions • Monitoring and Evaluation Plan
Finance	To develop and implement the Water Fund's model for financial sustainability, which is capable of financing and ensuring the ongoing operation (including implementation of selected interventions and execution of other related activities) of the Water Fund.	1. Determine how much resources are required. 2. Develop strategy for securing resources. 3. Secure long-term resources to ensure longevity.	• Resource Needs (for creation and operation) • Business Case • Fundraising Strategy
Implementation	To develop and execute projects related to interventions, such as natural infrastructure and other projects that help improve water security, efforts here deliver tangible work products, such as reports, restored land, trees planted, etc.	1. Develop timebound strategic vision and plan for the region. 2. Implement compelling pilot projects and scale-up those strategies as impact is demonstrated. 3. Retain high calibre staff to lead and manage the WF.	• Strategic Plan. • Hiring. • Administrative and operational systems.
Communications	To engage stakeholders to create a shared vision of desired Water Fund outcomes, mobilise collective and coordinated action, and to report regularly on intermediate results.	1. Establish a shared vision between stakeholders. 2. Articulate benefits of the Water Fund to gain influence. 3. Assure consistency in communications and branding between stakeholders, partners, board members. .	• Water Fund Pitch. • Annual reports • Launch event.

SANBI Principles to Guide EI Investment

SANBI developed a guideline document in 2014 (SANBI, 2014) presenting seven principles to guide EI investment practically and have been summarized below. Although the document precedes the Water Fund, there are some important principles provided for the garnering of EI investment.

- Principle 1 highlights that EI investment, should focus on setting clear desired outcomes, benefits, and objectives. Additionally, explicitly defining the desired benefits and outcomes of the EI intervention will ensure that expectations of investors are managed.
- Principle 2 highlights that EI investment should focus on prioritising EI, i.e. strategically identified areas using the best prioritisation methods and tools.
- Principle 3 highlights that EI investment should be transdisciplinary, allow for individuals from different disciplines to contribute to the investment process through their experience and expertise.
- Principal 4 emphasises that EI investment should be aligned to existing programmes, where possible/applicable, as these programmes may have capacity to support EI investment as they are already longstanding institutional structures.
- Principle 5 highlights that investment in EI, should contribute to addressing pressing socio-economic challenges, such as poverty, job creation and rural development. Effort should be made to ensure that EI investment projects have direct socio-economic benefits.
- Principle 6 emphasises that investment in EI should be participatory and socially inclusive. This means that EI investment should consider the beneficiaries and associated socio-economic benefits of the investment in the development, planning and ongoing monitoring process of the project. This means that time, money, and appropriate skills can be suitably allocated at the outset of the project.
- Principle 7 highlights that investment in EI should incorporate a monitoring and evaluation aspect, which should be accounted for financially when planning EI interventions. This is to ensure that biophysical and socio-economic data is collected throughout the project, to assess and evaluate whether the intervention is working (track improvements) and track the socio-economic benefits which are the objectives of the study. A rigorous monitoring and evaluation plan to assess EI interventions would play a fundamental role in lobbying for investment in EI.

A case was made again within the report that finance mechanisms may need an improved pricing strategy for EI investment. International growth in investor driven investment in EI, which directly benefits investors and holds immense potential to scale up EI projects. Each potential funding source for EI, requires a customised/specific approach.

Ecological Infrastructure Investment Framework

In 2018, the Council of Scientific and Industrial Research (CSIR) was tasked by the Western Cape government to develop an Ecological Infrastructure Investment Framework[13] (EIIF) to help decision-makers within the private and public sector to decide on where and how to invest in EI, in order to

[13] It should be noted that the objective of the EIIF was to assist in deciding where and how to invest in EI within the Western Cape. Whereas the objective of this study will be to develop a user-appropriate EI framework to provide guidance on how to secure investment for EI management and rehabilitation from DFIs and private sector.

improve the ecological health of EI within the Western Cape. The EI framework, which was launched in 2020, was developed for a range of EI within the province, including the mountain catchments, rivers, wetlands and estuaries, the coastal environment, and rangelands. The framework was informed by the outcomes of a stakeholder engagement process and catchment prioritisation process. Additionally, the risks that may be incurred due to EI degradation and the associated benefits derived from functional EI, were also taken into consideration during the framework development, which was further informed by the engagement process. Some of the following risks were identified during the process and are mainly related to water security (primarily attributed to alien vegetation and rangeland degradation), risk to human life, property and job security attributed to unmanaged fires and floods and risks associated with food and job (in)security attributed to over-grazing. Related to this, the identified risks were prioritised according to areas/catchments requiring urgent attention, to assist in guiding the investment in EI.

The framework focuses on the potential opportunities to maximise the benefits of EI interventions through investment in EI to build ecosystem resilience (Audoin et al. 2021). However, the framework is considered a work in progress and a starting point to implement EI interventions, which can be further supplemented with research to address the pressing issues of poverty and unemployment. Additionally, the framework indicates that context specific factors related to the investor need to be considered. This includes the type of investor, duration of the investment and the institutional context of the investment. The framework was further developed through a catchment prioritisation process which was used to identify proposed areas for EI investment. This process was informed by three (3) workshops in which the ideal state of EI and associated threats to the ideal state of EI were identified. Through the consideration of the outcomes of the workshops and taking account of the strategic water source areas (SWSAs) and main objectives of the project, nine (9) threats to the ideal state of EI were identified. These were used to inform the catchment prioritisation process and associated framework. Within the Western Cape EIIF, the spatial priorities identified are regarded as a starting point, with further investigation required to inform what type of investment is required and the water security benefits derived from investment in EI within a specific area.

Box 5: Definition of Strategic Water Source Areas (SWSAs):

Strategic Water Source Areas (SWSAs) are areas of land that either: (a) supply a disproportionate amount of mean annual surface water runoff in relation to their size and are considered nationally important; or (b) have high groundwater recharge and are locations where the groundwater forms a nationally important resource; or (c) are areas that meet both criteria (a) and (b) (Le Maitre et al. 2018).

The identified risks associated with degraded EI based on the stakeholder engagement and catchment prioritisation processes allowed for the development of four (4) investment objectives (Audouin et al. (2021 p. 21):

(i) "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.

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

(iii) To sustainably support local livelihoods and food supply provided by the province's rangelands through improved land use practices.

(iv) To reduce the exposure of communities, the environment, infrastructure, and economic activities to the impacts of increased flooding (due to climate change, for example) within the catchment and along the coast."

South Africa faces a range of environmental challenges, related to water security. Concerning this, the government has made extensive investment in EI interventions with a particular focus on increasing water access, availability, and job creation. A study was conducted, within the Breede, Berg and uMngeni catchments, which are the main water provisioning catchments in South Africa (Rebelo et al. 2021). The study was aimed at assessing the socio economic and ecosystem benefits derived from EI interventions within the three catchments. The assessment comprised of a literature review to collate evidence of the benefits of EI investment for the cases identified within the project areas, and the development of a framework. An '**ecological infrastructure intervention - ecosystem services' (EII-ES)** framework was developed, which was used to theorise scenarios of the socio ecological benefits of EI interventions within different EI projects. Within the framework, seventeen (17) examples were theorised of the potential benefits different EI interventions would have on the ecosystem service delivery processes and outcomes (costs and derived socio-economic benefits) of a proposed EI project. To provide an evidential base for the various scenarios, examples of EI interventions were drawn from literature, workshops and engagement with experienced stakeholders involved in EI protection. The results from the EII-ES framework, revealed that there is often a 30% chance of a positive outcome from EI projects, specifically an increase in ecosystem service delivery.

Principles for Responsible Investment

The Principles for Responsible Investment (PRI) refers to an investment practice which considers the environmental, social and governance (ESG) factors in investment decisions and active ownership (Døskeland and Pedersen, 2015). Responsible investment makes social, environmental and governance factors and financial return on investment a priority. Within academia and the financial industry, it has been recognised that responsible investment is critical in reducing company related risks and has a greater chance of a longer return on investment (UNPRI, 2021; Døskeland and Pedersen, 2016). Additionally, beneficiaries and clients are requiring more transparency regarding where their money is being invested as related to business operations and subsequently impact on ESG factors. Further, responsible investment is becoming more important as regulators such as the Global Reporting Initiative and the International Sustainability Standards Board mandate investors to consider ESG factors in their investment decision making processes with clients. The role of the PRI is to support and encourage voluntary adoption of the principles and that they are collaboratively implemented. The six (6) principles were developed in 2005, by a global group of some of the world's largest organisational investors and supported by the United Nations (UN). The global group of investors committed to the following principles, which they also encourage other investors to adopt (UNPRI, 2021, pg. 7)

"To include ESG factors/issues into the investment decision making process: actions that can be undertaken under this principle include but are not limited to, supporting the development of ESG related tools, metrics, and analyses. Analyse the potential for internal investment managers to include ESG factors within their business operations and investment decisions." (UNPRI, 2021, pg. 7)

1. **We will be active owners and incorporate ESG issues into our ownership policies and practices:** proposed actions under this principle having dialogue sessions with businesses on

ESG issues, request investment managers to report on ESG-related engagements and encouraging investors to partake in collaborative engagement initiatives, to name a few.

2. **We will seek appropriate disclosure on ESG issues by the entities in which we invest:** Possible actions that can be adopted by investors or investor companies under these principles include requesting for standardised ESG reporting from investor companies using tools such as the Global Reporting Initiative (GRI). Another possible action is the incorporation of ESG factors within annual financial reports, and support shareholder organisations with supporting ESG disclosure**.**
3. **We will promote acceptance and implementation of the principles within the investment industry:** possible actions include providing clear information on the ESG expectations to investment service providers, revisit relationships with service providers who fail to meet ESG standards and supporting policy developments that allow for the enactment of the principles.
4. **We will work together to enhance our effectiveness in implementing the principles:** In an effort to implement the principles in an effective manner, the proposed actions include but are not limited to collaboratively attending to arising issues, encourage the development of collaborative initiatives and support or participate in networks and information platforms to share and enable use, sharing and learning from investor reporting.
5. **We will each report on our activities and progress towards Implementing the Principles:** Possible actions include but are not limited to, sharing how ESG issues are incorporated within investment practices, disclose the requirements of service providers as related to the principles and communication with the beneficiaries on the principles and ESG issues (UNPRI, 2021).

Business Case Development Process

The development of a viable business case that quantifies and articulates the costs and benefits of transformative riverine management across different sectors has been critical to the successful implementation of Durban's Transformative Riverine Management Programme (TRMP). The business case builds a financial case for investment in transformative riverine management for specific audience(s). Its purpose is to demonstrate the project's importance and create the motivation for additional support and investment.

- A business case is particularly important when engaging stakeholders that need cost-benefit figures to demonstrate the value-add of investment in rivers.
- A business case can persuade a range of funders to make the investments required, including the municipality itself, businesses and property owners, and global climate funders.

The Durban TRMP business case development was led by a cross-sectoral project team termed the Business Case Sub Committee (BCSC) in eThekwini Municipality with support from C40 Cities Finance Facility (C40 Cities Finance Facility 2022a). The business case makes the case for systems-thinking, cross-sectoral collaboration, and investment from the city and external stakeholders (e.g. private landowners, businesses, donors) to achieve the ambitious goals of the TRMP, including managing and rehabilitating EI. Developing the TRMP business case required several transformative paradigm shifts (C40 Cities Finance Facility 2022a):

- Recognition of the value of natural ecosystems as a key component of climate change adaptation, and the appreciation that the cost of river management generated benefits that exceed the costs.
- Adoption of an analytical approach that integrates hydrological modelling with climate circulation models, multi-factor vulnerability assessments, and cost benefit analysis.
- Application of Nature Based Solutions and Ecological Infrastructure to solve challenges of flooding and urban surface water systems, and recognition that EI assets require the same level of maintenance as built (grey) infrastructure.
- Implementation of partnership-based approaches to riverine management and funding, which involved cross-sector collaboration across municipal and government departments as well as with the private sector.
- Incorporating the ecological and circular economy into the process to create permanent jobs, grow opportunities for community enterprises, and support recycling value chain development pathways.

An overview of the eight steps in the TRMP's business case development process is provided in the figure below (**Figure 9-1**). It is important to note that implementation of the steps overlap, rather than being undertaken as isolated or consecutive steps.

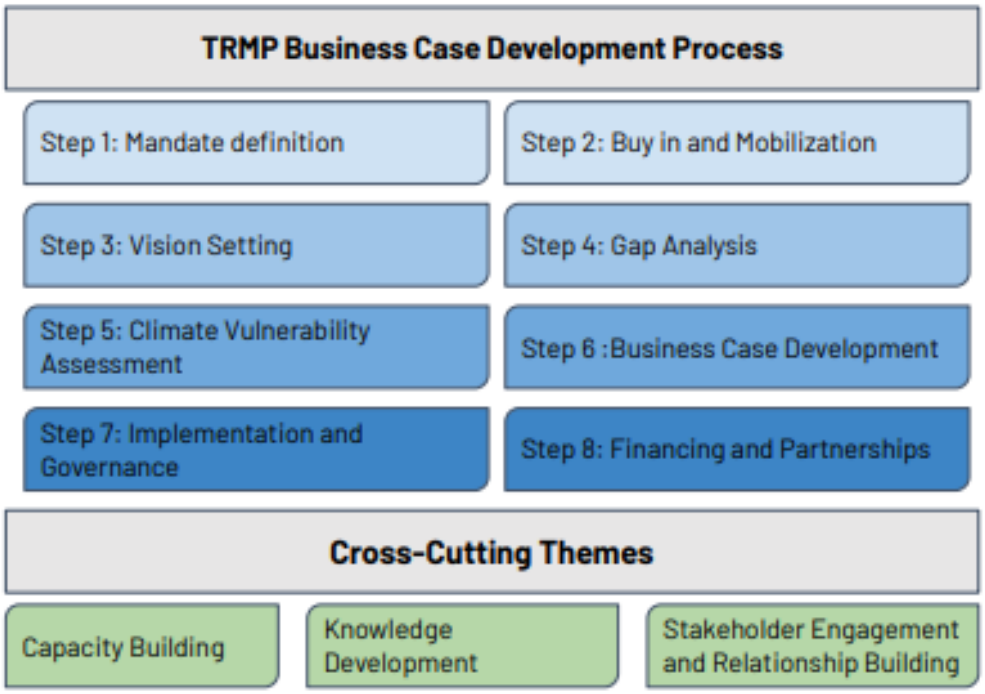

Figure 9-1 Overview of TRMP Business Case Development Process (C40 Cities Finance Facility 2022a, p11)

- **Step 1: Defining the Mandate**
    - Political leaders and relevant city departments must agree that riverine management is a priority within the mandate of the city. Consensus amongst technical and political leadership is a prerequisite prior to commencing with the project, to ensure adequate political commitment, alignment with the city's mandate and strategic priorities, and secure buy-in from the relevant sector departments involved in the project.
- **Step 2: Buy-in and Mobilisation**

- Internal inter-departmental and external multi-stakeholder project steering committees (or other governance arrangement) need to be established to coordinate the development of a business case for transformative riverine management. Various steering committees can be considered for example: Operational steering committee; Technical steering committee; Political steering committee; and External stakeholder reference groups (representative of interested and affected parties i.e. riverine community, organised business etc.).
- In the case of Durban, the technical work to develop the business case was undertaken by a core group of officials who led the process through a Business Case Sub-Committee (BCSC). The development of the TRMP business case was therefore linked to an existing structure that was strongly led at a political and administrative level. The BCSC includes officials from the following departments: Environmental Planning and Climate Protection Department; Coastal and Stormwater Catchment Management Department; Natural Resources Management Branch; Roads & Stormwater Maintenance; Senior Project Advisor CFF City Cooperation Unit; Economic Development Unit (which includes the Business Support Unit).
- Demonstratable regional and local impact is critical for mobilising local support for the project. The aim of the Durban TRMP is to upscale existing initiatives such as the Sihlanzimvelo Stream Cleaning Programme, and the Green Corridors Programme. The Sihlanzimvelo Programme provided the basis from which a lot of the work was motivated.

- **Step 3: Vision Setting**
  - The vision is a crucial step to building consensus, and provides a framework for delivering the project's actions, objectives, and deliverables within a defined scope.
  - The vision can be created during an inclusive theory of change workshop with the relevant stakeholders. The project goal, intended inputs, activities, outputs, outcomes, and impacts are generated at the start, and can be adapted as the project progresses to reflect the views of other/new stakeholders with new lines of thinking.
- **Step 4: Gap Analysis**
  - Knowing how much data is available, its relevance and quality, is essential to developing a credible cost-benefit analysis. The Gap Analysis assesses the river catchment data available. including existing and planned riverine management initiatives.
  - The Gap Analysis supports an approach for climate vulnerability assessments and hydrological modelling. Identifying data gaps early on is crucial as this will impact the selection of specific catchments or sub-catchments, stakeholders consulted, and the project approach, cost, timeframes, and assumptions.
- **Step 5: Climate Change Vulnerability Assessment**
  - A Climate Change Vulnerability Assessment (CCVA) is used to determines the impact of climate change on rivers. A CCVA identifies the local drivers of river vulnerability, including direct and indirect impacts of climate change, as well as non-climate related drivers (e.g. social, service delivery etc.). The current (baseline) and future vulnerability of rivers can be evaluated for different climate change scenarios or projections.

- The CCVA establishes the basic metrics upon which the Benefit Cost Analysis (BCA) is developed. It is the basis for identifying, prioritising, and calculating the cost of river restoration measures. The CCVA shows what the climate impacts will be, who is vulnerable, the extent to which they will be affected, and who will benefit from improved riverine management in a specific catchment.
- Data availability (as assessed during the Gap Analysis (Step 4)) determines the scope of the CCVA. Even in the absence of comprehensive data alternative approaches can be considered to address data gaps, such as the use of proto-catchments and proxy data. It is also crucial to engage a range of stakeholders to better inform the CCVA results.

- **Step 6: Business Case Development**
  - The Business Case presents a rationale for investment in transformative riverine management city-wide, targeted at specific audience(s). It is built on an evidence-based approach, which is informed by a process of specialist studies and stakeholder consultations.
  - The Cost-benefit Analysis (CBA) builds on the findings of the climate vulnerability assessments and hydrological modelling and quantifies and articulates the costs and benefits (ecological, social, financial, and economic) of investment in the riverine management interventions identified, including both municipal and societal avoided damage costs. An appropriate approach for quantifying the costs and benefits of transformative riverine management must be carefully selected, and the benefits and limitations of each approach must be considered in the context in which it is being applied e.g. Cost-Benefit Analysis (CBA), Multi-Criteria Analysis (MCA), or Cost-Effectiveness Analysis (CEA).
  - Durban's business case is also informed by a review of the water management regulatory framework and service delivery models, gender and green economy assessments, and an Ecological Infrastructure Toolkit developed through the programme.
  - The benefits expressed in a Business Case will be limited by the data available for each intervention identified. The city needs to start conservatively and then expand the cost-benefit estimates to incorporate a systems-thinking approach. Assumptions must be defined at the beginning of the process.
- **Step 7: Implementation and Governance**
  - An implementation framework specifies how transformative riverine management will be mainstreamed, practically implemented, and managed/maintained at the city, catchment, and precinct level, over the medium to long term. The scope of the framework should include proposals on the institutional vehicle required to source and manage funding, and oversee facilitation and implementation, the resources needed to expand existing programmes, intervention prioritisation and sequencing (phasing), business plans, governance models and implementation pathways.
  - The development of the implementation plan presents a greater level of practical detail and is a critical opportunity to align ideas on how implementation should happen.

- **Step 8: Financing and Partnerships**
    - A detailed implementation framework identifies potential financing options and sources or mechanisms at the city, catchment, and precinct levels.
        - Funding source will have unique requirements and processes (e.g. Development Financial Institution, insurance sector, climate finance, private sector/commercial banks).
        - Partnerships (e.g. with different landowners etc.) are required both for funding implementation and maintenance.
    - Innovative financing mechanisms and blended finance approaches are needed for implementing transformative riverine management projects as a result of their large scale. Financing therefore typically includes a combination of financing applications (e.g. grants, loans etc.) and the city's budgeting processes. Appropriate financing mechanisms and partnerships therefore need to be established and detailed in the implementation framework.
        - The trade-offs of the different financial sources must be considered in the best interest of the city e.g. extensive lead times, high loan interest rates, new/untested innovative solutions etc.
        - The objectives of the city and the funder needs to be aligned, and elements of the implementation plan must therefore be carefully aligned with funding opportunities.

Capacity building, knowledge development and stakeholder engagement and relationship building are critical cross cutting themes that need to be undertaken in parallel with the eight steps to building the business case.

Opportunities and Risks for Investment in Ecological Infrastructure

The uMngeni River Basin supports over six million people, providing water to South Africa's third largest regional economy. A critical question facing stakeholders is how to sustain and enhance water security in the catchment for its inhabitants. The role of EI in enhancing and sustaining water and sanitation delivery in the catchment was the focus of a WRC funded project (Jewitt et al. 2020) that explored the conceptual and philosophical basis for investing in EI. In short, the project aimed to guide catchment managers when deciding "what to do" in the catchment to secure a more sustainable water supply. While a seemingly simple question, through working in spaces where EI is taking place, it became evident that socio-economic, environmental, and political relations in the catchment play a critical role in making EI investment possible, or not possible.

The findings of the study were synthesised into the 'Opportunities and Risks Framework for Investment in Ecological Infrastructure' (**Figure 9-2**) to guide future EI investments (Jewitt et al. 2020).

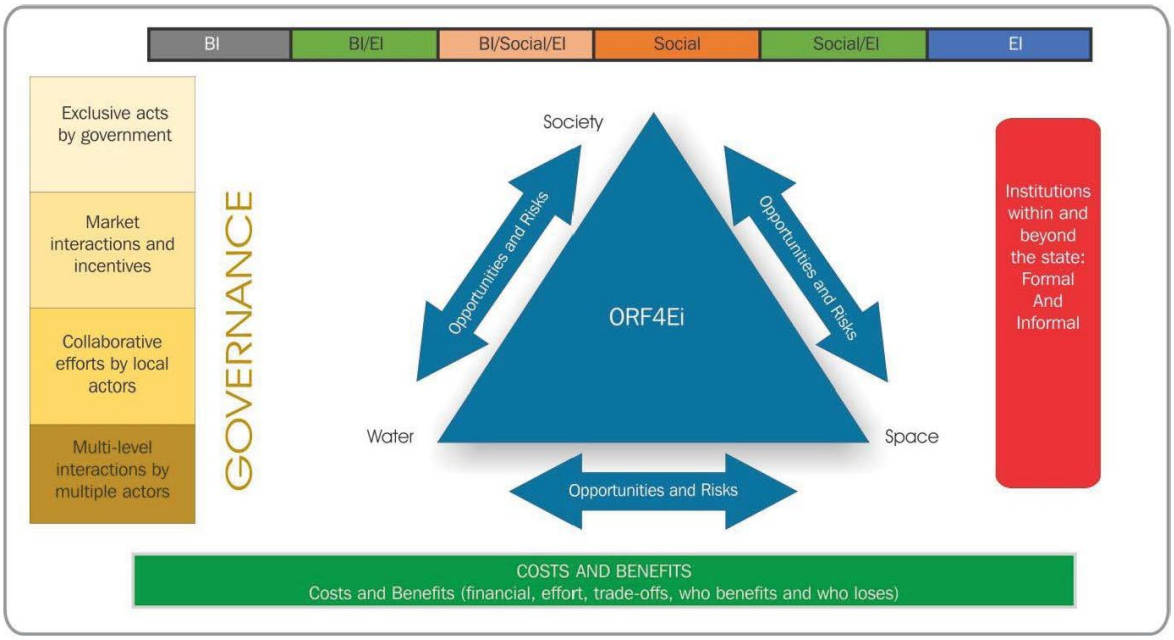

Figure 9-2 Opportunities and Risks Framework for Investment in Ecological Infrastructure (Jewitt et al. 2020, p37)

The framework emphasises that EI interventions need to be considered and evaluated in terms of the governance arrangements in the catchment, the formal and informal institutions which govern and shape the catchment and the specific society-water-space relations of the catchment. The costs and benefits of the interventions will also shape the decisions being made. A further key emphasis of the framework is that opportunities for water quantity and quality benefits from investing in EI are optimised from a perspective that views water security investments along a continuum (**Figure 9-3**) where built infrastructure (BI) and EI investment complement each other**.**

BI	BI/EI	BI/Social/EI	Social	Social/EI	EI
Wastewater treatment works with piped systems for inflow and outflow	Dam in a catchment with ecological restoration programmes	Wastewater treatment works, rehabilitating a wetland and training of EnviroChamps	Social learning and environmental education, developing sustainable practices and ethics of care	Alien invasive plant clearing through EnviroChamps (DUCT)	Installation of a wetland, rehabilitation of grasslands

Figure 9-3 A continuum of water security interventions (Jewitt et al. 2020, p78).

Based on the experiences and analyses of the research, 'Key Lessons for Investment in Ecological Infrastructure' emerged, including:

1. Investing in Ecological Infrastructure enhances catchment water security.
2. Investing in Ecological Infrastructure or Built/Grey infrastructure is not a binary choice.

3. Investing in Ecological Infrastructure is financially beneficial.[14]
4. Understanding history, legacy and path dependencies is critical to shift thinking.
5. Understanding the governance system is fundamental.
6. Meaningful participatory processes are the key to transformation.
7. To be sustainable, investments in infrastructure need a concomitant investment in social and human capital.
8. Social learning, building trans-disciplinarity and transformation takes time and effort.

[14] A case assessment was conducted on a small urban catchment, located in the Baynespruit, which included a cost comparison with the aim of finding the most appropriate intervention for water quality and stormwater management. The assessment found that the cost of investing in EI as compared to built EI interventions, was relatively lower due to the low implementation cost associated with it. For example, the revegetation of degraded riparian areas contributed to the improvement of water quality and stormwater control, while providing additional benefits such as aesthetics and recreation. Whereas built EI interventions, such as the installation of a weir, is more costly to implement and maintain and has less socio-economic benefits (Jewitt et al. 2020).

MECHANISMS AND SOURCES FOR EI INVESTMENT

In order for any form of EI project to commence, some degree of investment is required, both in the form of commitment to the project but more importantly from a financial perspective, with the latter often being the largest hurdle to overcome. Various financial mechanisms can be a catalyst for a suite of public and private investment sources.

Financial Mechanisms

According to NBI (2019) investors and financial mechanisms can play a critical role in influencing business activities and goals, as they determine how and where funding for EI projects is allocated, the nature of the funding can provide a conducive environment for innovation. Browder et al. (2019), notes that private financial mechanisms, are key role players in influencing EI investment as the type of private financial mechanism can inform investor funding decisions relating to EI projects, and the overall objectives of an EI project. Browder et al. (2019) highlights the following private financial mechanisms as key role players influencing EI investment:

- **Environmentally focused bonds (commonly referred to as "green bonds"):** Investors are becoming more inclined to making investment decisions that have a positive environmental and social outcome, while gaining financial returns. Thus, more investors are investing in green bonds. Green bonds allow investors to make long-term investments in EI projects while minimising risks, as green bonds do not require upfront capital investment, but can be used overtime.
- **Pay for success:** also referred to as a social impact bond, is a contracting mechanism that makes use of private sector investment to fund EI projects. Private sector investors make an advance payment for an EI, of which repayment of the capital investment is dependent on whether project deliverables are achieved.
- **Corporate Stewardship:** Multi-national companies are key role players that influence EI investment as their decision to invest in EI, stems from a responsibility to ensure sustainable water security and management within the catchments or areas they operate in. An example of a company making active investment in EI, is Coca-Cola, who have implemented a "Source Water Vulnerability Assessment Tool" to determine the water security risks of watersheds, in the areas that they operate. Through this, the Coca-Cola can respond to water risks in a timeous manner, posing less risk to the company.
- **Water Funds:** This financial mechanism combines funds from an array of public and private stakeholders with the goal of funding projects that contribute to water conservation and sustainable management of water resources, to ensure water security. Water funds provide an opportunity for diverse sources of funding to be mobilised through the diverse stakeholder base.
- **Private-Public-partnerships:** This mechanism allows public and private sector stakeholders to be involved in the project planning, implementation, and maintenance of EI projects, through contractual agreements. Through this partnership, both private and public stakeholders can combine and funnel funding and resources to commonly shared EI projects.
- **Insurance payments for risk reduction:** Insurance products that are ecologically driven, such as flood mitigation bonds allocate funding for green infrastructure in an effort to mitigate risks associated with weather related events (Browder et al. 2019).

The National Biodiversity Institute (NBI, 2019) report outlines a range of role players who are potential enablers of lobbying the private sector to invest in EI. These are expanded upon more broadly in Error! Reference source not found.. The role players outlined below have significant influence on the actions and direction of a company, particularly when considering EI investment.

Table 9-4 Current and future role players influencing corporate engagement in EI (NBI, 2019)

Role players	Description and level of influence
Investors	• Investors can have considerable influence on the decision-making process and the focus areas of a business. The level of interest and action of investors is primarily important because the interest of the investor becomes the interest of the company's senior management. Thus, the investor interest areas can be essential in influencing senior management of a company to become a champion in a specific focus area. • An example of the abovementioned is an interview conducted with one of the companies that had Nordea as an investor. Nordea is well-recognised for its particular interest in water risk at a global level. Owing to this, the company in question, helped the company redirect its overall objectives to align with water related
Regulators	• Companies are required to adhere to a suite of legislation and regulations, which may influence the behaviour of a company. Examples of regulators include taxes, incentives, and subsidies.
Senior management (CEOs and senior executive)	• These are the primary decision makers in a company. When senior management regard water as a primary focus area, it may become easier to gain buy-in from the rest of the company. This easily directs the internal operations of the company to meet the focus areas of water and helps companies in engaging in catchment management programmes. • For many Chief Executive Officers (CEO), water is already a key focus area within their industries, that much attention is focused on. Examples of such industries include food, beverages, textiles, mining, healthcare, agriculture, tourism, and manufacturing.
Employees	• Employees are the most important component of an organisation, as they drive the change. Therefore, their support regarding a new approach is critical in achieving the overall objectives of a business.
Partner organisations	• Partner organisations play a fundamental role of supporting, motivating, developing, and disseminating information to raise awareness, encourages companies to take action, and implementing pilot projects which all contributes to increasing company recognition. These factors all have the capacity to influence the operations of a business. • Business focused NGOs and companies have played a significant role in helping businesses recognise and potentially act on water security and the role of nature-based solutions. • Examples of partner organisations include World Wildlife Fund (WWF), the Nature Conservancy, the United Nations Environment Programme Finance Initiative (UNEP FI) and the CEO Water Mandate, to name a few.
Clients	• This refers to a company's largest buyer of a product or service.
Competitors	• Some companies adopt a certain approach or practice as a competitive strategy amongst its competitors. This has potential to encourage other companies or the broader economy, to follow suite.

Public and Private Sources of Investment

Several studies have identified a range of public and private sources of investment for EI interventions, and highlighted mechanism for accessing these sources of investment (Audoin et al. 2021; NBI, 2019). **Table 9-5** provides a summary of the primary sources of investment for EI interventions in South Africa, and examples of the range of mechanisms for accessing/leveraging EI funding. For each financial source and mechanism, the following is included:

- A description of the proposed financial mechanism or source and/or motivator for EI investment.
- Description and key recommendations associated with the investment sources/mechanisms.
- The level to which these have been applied/adopted within South Africa.

Table 9-5 Private and public sources, mechanisms and/or motivators for EI investment (Audoin et al.2022 and NBI, 2019)

Type and/or motivator	Description and key recommendations linked to the investment sources/mechanisms	Level of application in South Africa
a) Private sources and mechanisms for EI investment		
Water Risk Assessment Tools (specifically, the WWF Water Risk Filter, WRI Aqueduct and Ceres Aqua Gauge)	• Water Risk Assessments are used to identify the water related risks that are posed to a company, which encourages companies to make efforts to mitigate these risks through setting water related goals. • Water Risk Assessment Tools refers to assessments conducted tool to identify, manage and mitigate water related impacts which threatens water security. • WWF's Water Risk Filter and WRI's Aqueduct are regarded as two (2) of the most applied water tools by large, listed companies in South Africa. • These tools can make a considerable impact in influencing businesses to become active water stewards.	• For example, the Water Risk Filter, is recognised as having played a critical role through its application by Mark & Spencer in the UK, to support Woolworths with their water stewardship programme, which has now been adopted by other companies in South Africa.
Natural Capital Risk Assessment Tools	• Natural capital assessments are conducted to understand the dependency of a company on natural capital and the associated natural capital risks, related to the natural resources the company relies on. • It is recommended that a similar tool is developed and piloted within other banking sectors.	• The Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE) tool was applied by a major South African Bank in 2018/9. The aim of this project was to bring attention to water security and sustainable farming to the banks' agricultural team, which will be lending to South African commercial farmers. • An outcome of the piloting of the ENCORE tool, was an agriculture sustainability scorecard and questionnaire, which was also piloted by the bank within their farming group.
International Environmental standards (specifically, ISO 14001: Environmental Management System)	• The ISO 14001 is an internationally recognised standard for environmental management systems (EMS). The standard provides a guideline for organizations to design, implement and make efforts to improve their environmental practices and impact. • The ISO 140001 standard is an enabler for corporate engagement in EI, as companies must continuously improve their environmental performance and undergo an external auditing process to be recognised against the standard.	• Despite this standard not being as widely used as other ISO standards in South Africa, companies that are accredited with it are regarded as good partners to collaborate with in catchment management related activities. • The change in the ISO 140001 standard in 2015, which obliged companies to take care of the environment outside of its operations, prompted one of the companies represented to channel efforts to maintaining riverine areas around where the company was situated.
International Water Stewardship Standard (Alliance for Water Stewardship (AWS) Standard)	• AWS International Stewardship Standard (AWS Standard) is a global framework for major water users, to assess their water use and impact. Additionally, the framework encourages companies to collaborate with other stakeholders for sustainable management of water in the catchment context. • AWS has played a fundamental role of helping many companies recognise the value of water and the benefit in engaging with their external environment for sustainable water management. • The AWS standard encourages companies to consider the impact of their operations on the external environment. • The AWS standard is mostly applied within the food, forestry, beverage, agriculture, electronics, and manufacturing sectors.	No example is provided
Contextual Water Targets (International resting phase, South Africa pilot. Supporting institutions: NBI and CEO Water Mandate)	• This target aims to help companies acknowledge the importance of operating in a well-functioning and healthy broader water ecosystem, to ensure water security. • The notion of 'contextual water targets' encourages companies to consider their water use and impact beyond their internal operational activities and goals, but within the wider context of the water system.	• A relevant example which the concept of 'contextual water targets' can be compared to is the 'Science based targets' within the climate change sector. • This concept has influenced how businesses think about their carbon emissions. Taking this example into account, there is great potential for the area of 'contextual water targets' to impact the way companies operate both internally and externally and subsequently the water sector.
Supply Chain Risk	• Supply chain risk refers to a range of factors that can impact on the manufacturing and delivery process of goods and services. This can include natural disasters such as drought or floods which can negatively impact the production process, resulting in financial risk. • The risk presented by water use within a company's supply chain influences how a business operates both internally and externally. • It is recommended that companies consider their water use and impact within their operational activities.	• Companies within manufacturing, food, and beverages such as Woolworths, Coca-Cola and Tongaat Hullet, are some of the companies that rely on water within their supply chain, which makes it a material risk. • Thus, these companies engage closely with their water suppliers to ensure water security.
Efforts to minimize streamflow reduction and fire risk	• Companies operating within the forestry sector (that is, rely on natural resources as a key input to their business operations) have a responsibility within their company objectives to ensure adequate stream flow within the catchments they work in. • Further, companies that own plantations or forestry mills have an even greater responsibility within their company objectives of water stewardship and management within the companies they work in.	• The Mondi Water Stewardship Partnership is a prime example of a forestry company which relies on water resources for its operations and is a key investment driving factor. • Further, fire poses a significant risk to forestry companies, which prompts them to undertake fire prevention activities such as alien invasive plant clearing.
Aligning 'Green' and 'Grey' Investments	• Integrating green and grey infrastructure is a new concept that has gained traction, owing to the increased demand of ecosystem services mainly within urban areas. Both green and grey infrastructure work in harmony	• One of the company's interviewed highlighted that they incorporate funding for green infrastructure within their built infrastructure upgrades budget. This approach is particularly useful as it provides potential a potential

Type and/or motivator	Description and key recommendations linked to the investment sources/mechanisms	Level of application in South Africa
(company infrastructure upgrades)	to deliver enhanced ecosystem services, to meet the growing demand of a growing population. The integration of green and grey EI alleviates pressure form grey infrastructure to independently provide ecosystem services.	funding opportunity for more green infrastructure projects through grey infrastructure projects. This was done to ensure adherence to their certified environmental management system, particularly ISO14001 standard.
Black Economic Empowerment and Enterprise Supplier Development	• Considering the national importance of B-BBEE (Broad-Based Black Economic Empowerment) and the legal obligation for on companies to channel funding to Enterprise Supplier Development (ESD), there is opportunity for the abovementioned approach to be financially supported within companies. • This enabler applies mostly to food and beverage companies who have black suppliers within their supply chain. Within this mechanism there is opportunity for these companies to encourage their suppliers to adopt sustainable farming practices.	No example is provided.
Industry specific drivers	• Globally, there has been a rise in industries considering their water use and impact beyond their internal operational activities.	Examples of industries include: • **Power generation:** one of the key focus areas of the hydropower industry is reducing the sediment load in rivers. This is due to the fact that high sediment loads can block the turbines, increasing maintenance costs. • **Tourism:** the tourism industry relies heavily on water resources, and thus water security is a priority. Considering this, the Hilton hotel group has agreed to invest in the EI4WS project doing this work, in the Western Cape. • **Health care:** The healthcare industry has taken up water stewardship as a key focus area, since private hospitals are one of the major users of water. Although these hospitals have alternative manmade water sources, these are not infinite. • **Textiles and clothing:** the clothing industry has faced criticism regarding their water use and impact, attributed directly to their water discharges. This has led to increased water stewardship and effluent management within the sector, which is likely to increase overtime.
Voluntary carbon offsets	• Carbon offsets refers to the reduction of greenhouse gases by businesses or people through investment in projects that store or reduce carbon. This can be through the planting of trees or the conservation of forests. • South African companies can collaborate to reduce greenhouse gas emissions through restoring and protecting biodiversity hotspots such as grasslands and thickets. This would contribute to restoration of ecosystems and ensure greater water security in the future. • A few companies in South Africa participate in voluntary carbon offsetting. Related to this, there needs to be sufficient investment into projects that are focused on improving land use practices in an effective manner, that produces social an environmental outcome.	No example is provided.
Green Bonds	• A green bond refers to a loan that is issued for infrastructure projects, which also allocates a portion of the funds within the bonds to EI linked to the grey infrastructure. Thus, the infrastructure project can have both an environment and social outcome, which characterises it as a green bond. • The revenue generated from the grey infrastructure project will be used to pay back the loan which means that future costs of maintaining EI linked to the grey infrastructure would be minimised. • The 'Linking green and grey through project finance' mechanism can be taken further with Green Bonds. • The revenue generated from the grey infrastructure project will be used to pay back the loan which means that future costs of maintaining EI linked to the grey infrastructure would be minimised.	No example is provided.
The CSIR Green Book and South African Risk and Vulnerability Atlas (SARVA) online platform	• The CSIR Green Book is a guideline that helps national and municipal governments in settlement planning. • If these tools are used effectively, they would contribute to building a strong case for the EI4WS project, in relation to climate change.	• The CSIR Green Book and the SARVA online platform are useful tools that require further clarification, as they are not well known within the corporate space. Due to this, there is no example of application of the tool in South Africa.
Linking green and grey through project finance	• Project finance refers to the process of funding an infrastructure project through debt and equity. This financial mechanism has potential to provide funding for both green and grey infrastructure, through the incorporation of ecological infrastructure into the maintenance costs of grey infrastructure. • The recommendation provided by the REI4P programme for projects that may want to replicate the same model, is to ensure that an allocation of funds is made for EI investment within the grey water infrastructure projects, which will contribute to reducing insurance costs, community development and job creation.	• A prime example of this is the South African Renewable Energy Independent Power Producer Procurement Programme (REI4P) which demonstrates how investment in grey infrastructure can potentially be leveraged on to contribute social-economic benefits such as job creation.
The Task Force on Climate Related Financial Disclosures (TCFD)	• The TCFD is a global organisation formed in 2015, by the Financial Stability Board (FSB) which developed climate related disclosures to help companies progress and improve their reporting of climate related financial information. This includes companies reporting on the physical risk climate change poses to them, which includes water risk in the South African context.	No example is provided.

Type and/or motivator	Description and key recommendations linked to the investment sources/mechanisms	Level of application in South Africa
	• The goal of this, disclosure is to help companies become more transparent about climate related risks. This information is important for investors and for decision making, which can make for more informed investment, decision making and contribute to a sustainable, low carbon economy. • In the future, TCFD has potential to be a vehicle of change, where climate change is concerned. More and more companies are being obliged to report on their climate related risks, in order to help investors take the necessary measures to mitigate risks and become more resilient. • It is recommended that the physical risk of climate change on companies in South Africa, is emphasised on water and EI. This can be leveraged through TCFD to engage companies on the company water risk.	
The Sustainable Development Goals (SDGs)	• The SDGs have been recognized as a global mandate for countries to make a collaborative effort to end poverty, protect the planet, and ensure that people live in a peaceful world. These goals also contribute toward many countries' constitutional mandates to promote and preserve basic human needs. • The SDGs are made up of 17 integrated goals and 169 targets envisioned as working in conjunction to achieve development that balances social, economic, and environmental sustainability. The SDGs are not only steering the world to realizing a sustainable future in the next 15 years, but also present businesses with the opportunity to explore the potential of green technology, markets, and innovative thinking to realize the SDGs. • SDGs are recognised as mechanisms for EI investment as they can be leveraged on to redirect company objectives and focus areas to more sustainable an environmentally activities.	• An example of the mentioned implementation approach of this mechanism, is the work of the NBI. NBI seeks to help companies give precedence to SDGs and recognise which SDGs align with the company's objectives and activities. The Global Report Initiative is an example of an organization that provides a framework for businesses to report against their progress in developing a more sustainable business model. Through the appropriate management, this approach can yield significant results for a company.

A focus on company insurance costs and the reinsurance industry	• Reinsurance industry:
	  ○ Insurance companies currently find it challenging to fund and regard climate resilience as a financial output.
	  ○ A recommended approach for encouraging insurance companies to invest in EI, is to consider the standpoint of the insured instead of the insurer. This means helping companies find ways they can minimise insurance costs. That can be through helping companies reduce their risk to drought, floods, wildfires, and other climate change related events.
	  ○ Another potential point that can be leveraged is the is the reinsurance sector, which is very concerned about the effects of climate change on the insurance sector. This can be a potential avenue to engage the insurance sector in financing climate resilience more actively.
		The United Nations Environment Programme Finance Initiative Principles for Sustainable Insurance (UNEP FI PSI) is a global framework aimed at helping insurance companies consider social, environmental and governance related risks and opportunities within their business operations whilst meeting the goal of sustainable social and economic development (Bressan, 2023). The framework can be voluntarily adopted by insurance companies through the following principles:
		(1) Incorporating applicable ESG factors into the decision-making process of their business.
		(2) Collaborating with clients and business partners to bring attention to ESG related issues and establish solutions.
		(3) Collaborating with government bodies and relevant actors to establish and encourage the adoption of measures to address ESG related issues.
		(4) Maintaining public transparency of progress in adhering and adopting the principles (UNEP FI, 2012).

Operational Efficiency Measures Raising the Profile of Water/Cost-Reflective Water Tariffs	• Focusing on saving company costs at an operational level can be a good avenue to explore for companies, and an provide opportunity to engage in catchment-based projects. • For some companies, water is not a primary priority, however this can change with the inclusion of water conservation and water demand management (WCWDM) within a company's operational activities. This can help companies reduce costs and improve business continuity. • This will help companies understand and recognise the state of water availability and access in South Africa at a catchment level and the value of catchment management.	No example is provided.
A relevant Tax Benefit or Incentive	• South Africa has tax incentives for energy efficiency and renewable energy, and more recently for carbon tax. • A recommended approach is a tax incentive to place on water or biodiversity to encourage companies to act. Particularly because tax incentives directly interfere with a company's financial activities and legal team.	• An inceptive based approach in the European Union (UN) was implemented to encourage farmers to support natural resource stewardship through the Common Agricultural Policy.
Drought and Water Crisis	• A number of companies identified drought as a potential enabler for EI investment currently and the future. • The national drought which took place from 2015 -2018 propelled many companies to invest in internal water conservation approaches which financially benefited their company. • Additionally, the drought encouraged businesses to identify their water risks and develop strategies to minimize these risks. • It is recommended that media highlights the impacts of drought on economies and towns. The hope is that this will encourage companies to consider their water use and factor in sustainable management of water within their supply chain and broader catchment.	No example is provided.
Peer Learning/Voluntary Agreements and Recognition of Corporate Excellence	• There is potential for companies to learn from each other, in relation to biodiversity and water management through peer learning. • Environmental behaviours can be learnt from companies practicing it. This is particularly useful as companies often compete with each other, in this case it would be for a good cause. • A recommended approach is the recognition in the case of the NBI CDP programme, is for companies to be recognised for their water stewardship and biodiversity efforts.	• South Africa: NBI (CPD programme): The NBI supports voluntary actions and recognises company excellence through the CPD programme.

Type and/or motivator	Description and key recommendations linked to the investment sources/mechanisms	Level of application in South Africa
Other potential enabling institutions	• There are several industry bodies that can take a more active role in helping nature-based solutions, reliance of companies on natural capital, the linkage of natural infrastructure and grey infrastructure and the financial implication of degraded EI become more recognized.	• Institutions such as the South African Institute of Chartered Accounts (SAICA), the Institute of Risk Management South Africa (IRMSA), the Business Unity South Africa (BUSA), the banking Association South Africa (BASA) and the Institute of Civil Engineering (SAICE), are recognised as potential institutions that can play a greater role in raising the profile of EI, nature-based solutions, and the relationship between ecological and grey infrastructure.
The Green Climate Fund and Climate Adaptation	• Commercially driven projects for climate change adaptation can be recognized in South Africa. Such projects would be well positioned to obtain funding from the climate adaptation component of the international Green Climate Fund (GCF).	• SANBI is working in collaboration with the NBI to collate a list of national adaptation projects with business. For projects that have a biodiversity outputs, this could potentially be significant.
Heightened investor interest and action	• An investor is any company or individual who commits funding to a company with the expectation of a financial return on investment. • Companies prioritise what their investors prioritise and need. Investors in South Africa have shown an increased interest in environmental issues, particularly related to climate change. This could potentially be a mechanism that can be leveraged on to lobby for investment in EI. • For South African listed companies which have a range of investors, there is potential for them to engage with their key investors to raise awareness of environmental issues. This could potentially drive the change within companies and direct the focus area of investors to ecological infrastructure.	No example is provided.
Bank Capital Allocations, Lending Rates and Credit Assessments	• For example, a bank can decide to no longer invest in activities they no longer regard as a priority for them. Or they can make bigger investments or offer better loans to organisations that demonstrate good social and economic standing. • When making investments banks need to assess the risks of their investment. This entails banks assessing the risk posed by natural capital and water, which influences the lending practices of banks. • Commercial banks and DFIs can be highly influential in how companies operate, through the investment decisions they make and activities and organisations they lend money to. This can influence how the companies operate and what they prioritise. This is regarded is one of the strongest influences on economic change.	No example is provided.
Policy Direction for State Owned Enterprises	• SOEs refers to organisations or companies developed and managed by the national government to engage in profitable activities. • State Owned Enterprises (SOEs) are guided by policy and its practices is influenced by the Department of Public Enterprises (DPE). • It is noted that to influence the operations of a SOE, there needs to be a change in the policy direction of DPE as well as other entities such as The Presidency and National Development Plan.	No example is provided.
A Focus on Raw Water Users	• Raw water refers to water that has been untreated and is not safe for human consumption. Companies that use raw water can include farmers, who use it to irrigate their crops, and construction companies as component for developing their building materials like cement. • Companies that are responsible for treating raw water can minimise treatment costs by investing in the rehabilitation and maintenance of EI upstream of where they draw water from. This can also apply to farmers, especially if the raw water can affect the health of their crops or yield. • This can be a potential opportunity to address the declining water quality issue being faced in South Africa.	• The WWF-SA Conservation Champions is an example of an initiative that works in collaboration with the wine industry and subsequently wine farm owners to minimise their impact (expansion of vineyard footprint) on highly threatened and unique habitats within the Cape winelands. Through the support of WWF, the initiative has developed environmental management plans that ensure the implementation of sustainable farming practices, contributing to the conservation of ecosystems and unprotected habitats and the maintenance of optimally functional ecosystems. Thus, contributing to appropriate levels of freshwater flows within the catchments (WWF, 2024). • Additionally, there are a number of certification schemes, both local and global, that encourage farmers, traders, and processing industries to adopt for example sustainable agricultural practices. One such certification scheme is CERtification of Environmental Standards (CERES) certification body – a globally recognised certification scheme, which encourages sustainable farming practices and thereby, aim to reduce their impact on the receiving environment and thus freshwater ecosystems, as farmers are encouraged to use farming methods which subscribe to existing standards of organic organisations. This includes minimising and/or excluding the use of pesticides and fertilizers which may pose a risk to the surrounding environment, and inadvertently result in the degradation thereof. This certification body provides accreditation services which verify whether farmers and traders are producing organic foods through the adoption of sustainable farming methods within their food production process (CERES, 2024).
b) Public sources and mechanisms for EI investment		
Government appropriation for provincial ecological infrastructure programme	• This proposed financial mechanism refers to the allocation of national budget to the implementation of EI. The suggested approach is the funnelling of finances into the relevant provincial departments such as the Department of Environmental Affairs (DEA) within each province. The funding would be used to conserve, rehabilitate, and manage ecological infrastructure, particularly within Strategic Water Source Areas (SWSAs). The Department of Environment, Fisheries and Forestry (DFFE) and the National Treasury would need to decide	• An example of this financial mechanism is the Land Care Program in the Western Cape province which is seated in the Department of Agriculture, Land Reform and Rural Development. Within this programme, funds have been set aside to support a team of extension officers, to plan, engage and implement the process of land care interventions. This programme can also be duplicated within respective environmental departments but

Type and/or motivator	Description and key recommendations linked to the investment sources/mechanisms	Level of application in South Africa
	on a framework to guide the funding process of the EI intervention. For example, the framework can inform where the EI intervention is implemented, by whom and how. Additionally, other aspects the funding could focus on is the planning, implementation, and monitoring phases of the EI intervention. It is also suggested that the funding period for an EI intervention is medium to long term to leverage off existing programmes such as the Expanded Public Works Programme (EPWP). To enable implementation of the proposed financial mechanism, Audoin et al. (2021) highlighted the following key elements: • An institutional agreement between DEFF and the National Treasury on a framework to guide where and how an EI intervention takes place. • The grant framework should set out guidelines of where and how the funds should be used. This includes the recruitment process that is used, the operation costs associated with the intervention and the maintenance of the EI intervention. The expected outcomes of the intervention should not solely consist of input metrics, but also of desired outcomes of the EI intervention (Audoin et al. 2021). • A strategy should be put in place to address the financial challenges related to allocation of funds to implementing organisations in the agreed upon timeframe. Additionally, it would be beneficial to the EI intervention for the funding to be flexible to the changes that can come from EI projects, with environmental factors being unpredictable despite planning phases within projects.	operate in different geographic locations. The programme within the environmental department could focus on restoration of EI such as wetlands, estuaries, and coastal areas.
Water tariffs and charges	• **Water Resource Management Charge:** The suggested approach for this mechanism is for each Catchment Management Agency (CMA) to allocate budget to ecosystem maintenance and restoration which contributes to overall water security. For CMAs that have not budgeted for this cost, a minimal tariff should be put in place to cater for these costs. An additional recommendation for this financial mechanism is for the CMA to allocate the EI maintenance and restoration funds to a longer-term rehabilitation plan like the Catchment Management Strategy (CMS). The Natural Resource Management (NRM) programmes such as the Working for Wetlands (WfW) programmes can be useful in identifying priority catchments that require rehabilitation and a well-suited implementing agent for the project. The recommended implementation approach for the Water Resource Management (WRM) Charge, includes an approval of the timelines by the minister of Human Settlements, Water and Sanitation to remove limits from the tariffs. Another recommendation is the inclusion of an EI budget for the Breede-Gouritz Catchment Management Agency (CMA) based on a financially viable rehabilitation plan. It is recommended that the Berg-Olifants CMA be formally enacted, to enable the collection of WRM charges. Additionally, it is recommended that the Department Water and Sanitation allocate funds to maintain and restore EI within their yearly budgets. An additional recommendation is for the rehabilitation plan that is developed to align with the tertiary catchments with the costs estimated across CMAs. Audoin et al. (2021) suggest that CMAs could co-develop a framework with the implementing agents, depending on their areas of expertise. Examples of agents include CapeNature, Landcare and municipalities. The framework should specify the WRM resources available for the identified EI interventions (Audoin et al. 2021). Importantly, the report identifies that funding from the WRM and those of public works programmes should not be combined as the reporting requirements and monitoring metrics are likely to differ. Grant agreements should be established well in advance and be compliant to the relevant rules and regulations, of which discussions should be held with the auditor general. • **Water Resource Development (Infrastructure) Charge:** The Water Resource Development (WRD) charge can be used to contribute to EI restoration and maintenance. This can be done through collaboration with the CMAs and catchment partners to restore important EI in each water provisioning catchment or Water Management Area (WMA). These costs will be recovered through tariffs from users of the significant EI. These water charges would need to go through the same approval process as they would for costs related to hard infrastructure. An alternative would be to allocate costs for maintenance and restoration of EI to the costs associated with the development of hard infrastructure such as dams. These costs can be included in the civil engineering contracts, which would make this approach easier to implement. A recommended approach for the implementation of the Water Resource Development charge is, for the Department of Water and Sanitation to enact a policy stance that allows for EI investment and restoration is for it to be a programme that incorporates planning and budgeting. An additional recommended approach is for a decision to be made on whether the costs for EI maintenance and restoration of significant EI linked to built infrastructure needs to be accounted for within the built infrastructure budget. Alternatively, the costs associated with maintenance and restoration of EI can be incorporated within a WMA-wide EI programme which can be developed, with costs regained from all water users in the WMA. A WMA-wide programme could	An example of financial mechanism 2 (water tariffs and charges) is the rehabilitation of the Berg River wetlands. The costs related to the rehabilitation of the wetlands and riparian zone was estimated, which includes interventions such as the removal of unnecessary flood berms. The proposed interventions could potentially contribute to improved water quality and risks of flooding. To implement this intervention, the following can be undertaken, the costs associated with rehabilitating the wetland can be allocated to water initiatives located in the lower and middle portions of the Berg River. Additionally, the costs associated with clearing AIPs significantly affecting water availability within the water system and costs related to wetland rehabilitation, can be incorporated into the Lower Berg – Voelvlei augmentation scheme. (b) An example of financial mechanism **2 (b)** is the Cape Water Fund, which estimated the water loss within the Western Cape Water Supply System (WCWSS) catchments as a result of the Invasive Alien plants (IAPs) infestations. The cost for clearing IAPs within the catchments is estimated to be R370 million. The addition of an 'EI tariff' can potentially contribute R20 million to rands a year to these costs. Although this estimate of EI tariffs will not address all EI needs, it can act as a reliable source of funding for addressing the most destructive IAPs within the catchments in a financially friendly way. There was no example provided for financial mechanism 2(b).

Type and/or motivator	Description and key recommendations linked to the investment sources/mechanisms	Level of application in South Africa
	potentially include the catchment rehabilitation plan which is in the CMS. This could particularly be useful for expensive project interventions. Another recommendation is for implementers of the EI interventions to report to the Department of Water and Sanitation on the hydrological and water service delivery outcomes of the project. Additionally, it is recommended that new infrastructure agency allocate funds from the WRD charges received, to the appropriate implementer. • **Water Tariffs (Bulk or Retail):** The enactment of this financial mechanism would entail a regional utility, integrating the costs associated with a proposed EI intervention within its budget, and charging water users appropriately. The proposal of regional utilities incurring the charge through water tariffs, is recognised as a more reasonable approach. The charging fee can be decided upon through an assessment of the EI intervention planned, taking into consideration the implementation plan. Preferably, the EI interventions should be water services development plan of the region. The recommended approach for this financial mechanism, highlights the need for the suitable role players and regulators to be involved in the initial engagement process before implementation of the mechanism. Suggested role players include Treasury, the Department of Water and Sanitation. Further to that, the mechanism would require further testing and refinement and should not be considered as a final product. Additionally, a crucial step which would enable this mechanism to be implemented is the acknowledgement of EI maintenance and restoration as a fundamental water service provided by water provisioning entities/bodies. Regional utilities would then need to conduct the necessary stakeholder engagements to successfully communicate to the water sector the need to make more investment in EI and catchment conditions beyond WRM charges. From a financial administration perspective, a water provisioning entity (regional utility) would need to collect charges from bulk water users (public) and redirect those funds into investing into the catchment rehabilitation plan. Furthermore, if the utility is a municipality, they could incorporate the levies for EI into their water provisioning-built infrastructure or as a direct levy attributed to the WSA status of the catchment. Alternatively, the levies could be redirected to coordination mechanisms or to Non-Governmental Organisations (NGOs) that implement EI restoration projects. These funds can also be redirect to service providers to ensure that agreements made during the planning process of the EI maintenance project.	
Government Financial and Regulatory Incentives and Disincentives	• A range of regulatory and financial mechanisms can be implemented to financially motivate landowners into investing in EI. However, it would be more useful for these funds to be redirected into activities contributing to EI degradation to necessitating effective rehabilitation. Other incentives can also contribute to improving the effectiveness and reach of current government programmes related to EI by encouraging the adoption of sustainable land use practices. This financial mechanism would need to be developed with the relevant role players. Government departments such as the Department of Water and Sanitation, the Department of Agriculture, Land Reform and Rural Development can implement financial mechanisms such as rehabilitation directives, financial provisions, and administrative penalties to address EI degradation whilst avoiding long planning processes. • **Directives:** If an environmental authority believes that someone has significantly degraded the environment, they are lawfully given authority through Section 24(f) and 24(g) of the National Environmental Management (Act No. 107 of 1998), to address the damage through their personal funds or for the environmental authority to conduct the rehabilitation and recover costs from that person. It is imperative that when authorities pass a Pre-Directive or Directive, the EI rehabilitation outcomes required for damage to EI by a specific party are clearly laid out for the party and monitored within the duration of the project. • **Administrative penalties:** This financial mechanism is enacted when an individual or organisation refuses to adhere to the directives outlined in the National Environmental Management Act (NEMA) (Act No. 107 of 1998), commits a crime or is a repeat offender. In this case, the individual or organisation can be charged with an administrative penalty of R5 million on the first offence. The penalty, however, is dependent on the severity of the of the EI degradation. However, what is most valuable is the effective implementation of the directive rather than the issuing of the penalty. • **Financial provisions:** NEMA (Act.107 of 1998) and the National Water Act (Act No. 36 of 1998) (NWA) allow the Department of Forestry, Fisheries and Environment (DEFFE) and the Department of Water and Sanitation to request for funding for potential environmental rehabilitation related to specific activities. It is proposed that a similar financial allocation can be conducted for development and management plans, to ensure that associated activities do not further damage EI.	No example of this financial mechanism was found/provided.

Type and/or motivator	Description and key recommendations linked to the investment sources/mechanisms	Level of application in South Africa
Institutional or commercial investors	Commercial investors include asset managers, banks, insurance companies, and hedge funds. These investors often invest through the acquisition of assets, with the goal of getting a good return on investment. Although the return on investment for EI interventions could be relatively low for commercial investors, impact investors are willing to earn a lower financial return on investment if it will have a positive social or environmental impact. Additionally, commercial investors are encouraged to invest in an environmentally and socially conscious manner by global organisations such as the Principles for Responsible Investment (PRI) and Environmental, Social and Governance (ESG) investing (Letley and Turpie, 2023).	
Funding through state budgets	In South Africa, funding for catchment restoration and rehabilitation is largely derived from the national budget and funnelled through the Natural Resource Management Programmes and DFFE who use about R2 billion rands per year on catchment restoration (Letley and Turpie, 2023). Despite this allocation, funding for EI restoration and rehabilitation within the national budget is largely regulated and insufficient to meet the growing need of EI restoration and rehabilitation. Additionally, these funds have dwindled over the years (Letley and Turpie, 2023). To put into perspective the present financing needs of EI, Letley and Turpie (2023) noted that for investment in EI and natural resource and maintenance to be effective, six times more of the current funding is required. An estimate of R270 million is required as investment to restore the uMngeni catchment and about R370 million required for SWSAs. Similar to the water tariffs (bulk or retail) financial mechanism proposed by (Audoin et al. 2021). Letley and Turpie (2023) proposes that potential funding for catchment restoration and rehabilitation exists through the payment of ecosystem services within the water sector through regional utilities providing water services.	

Examples of Management and Financing Options for Sedimentation and Siltation

Silt and Sedimentation Management as an Example of EI Investment

Sedimentation is a naturally occurring process that is closely linked to the hydrological cycle, which contributes to creating coastal ecosystems and is an integral in the formation of rivers and coastal habitats. High levels of erosion and poor land use practices have increased the rate at which sedimentation occurs (Van Zyl et al. 2022). Traditionally, soil and vegetative cover loss was attributed to overgrazing and poor land use practices. Conversely, Van Zyl et al. (2022) notes that sedimentation rates declined in the 1950s owing to the decline in the number of livestock. However, in South Africa there is evidence of an increase in the rates of sedimentation, attributed to intense weather patterns and the rise in settlements within peri-urban areas. Dams located upstream, have contributed to the increasing rates of sedimentation as they trap sediments that should be flowing downstream with the inflow. Sedimentation of dams' results in a loss of storage capacity, affecting some of South Africa's major dams e.g. Gariep. An assessment conducted by CSIR in 2016, noted that an estimated 9% of dam storage capacity has been lost due to sedimentation. Within some catchments, the rates at which sedimentation is occurring is extremely high. Two examples include, the Shongweni Dam (62.2%) and Hazelmere Dam (26.1%), which are regarded as some of South Africa's most important dams.

With South Africa being a water scarce country, this poses a serious concern, both environmentally and economically. Further to that, it puts into perspective the urgent need for sediment management which can potentially build an economic case for the investment in siltation management (Van Zyl et al. 2022). To further strengthen this, a review of 37 South African restoration projects was conducted in which the study found that the cost of investing in EI restoration was less than the benefits derived from the restored system, particularly relating to water, food, and biodiversity. For example, the cost associated with not restoring degraded EI was estimated between R400 and R1600 per hectare per year. In comparison the costs associated with implementing EI restoration activities, which include reseeding and replanting eroded gullies, would avoid a loss of R800 per hectare, whilst reseeding and replanting avoided a loss of R6200 per hectare. Taking these amounts into account, it is evident that the costs related to restoration of degraded EI is lower than the cost of not restoring the degraded EI.

Despite the opportunity cost associated noted above, the subjectivity at which water is valued and subsequently costed makes it difficult to lobby for the inclusion of sediment management and/or prevention activities within projects and the initial decision-making processes for developments (Van Zyl et al. 2022). The consideration of sediment management should not only focus on the potential reduction of water lost, but also on the socio-economic opportunities such projects could present, in the form of job creation and improved livelihoods. This can be translated as a return on investment where investment in sediment management is concerned.

Within the climate and ecological fields, blended financing is well respected and recognised although difficult to execute. There are two (2) factors that need to be considered for a blended finance approach to be sustainable, including:

(i) The benefits derived by beneficiaries within the private and public sector need to be recorded at the catchment scale. These benefits must also be costed, which often poses a challenge.

(ii) There must be sufficient organisational capacity to coordinate and manage the implementation of interventions associated with silt management. This can pose a challenge in South Africa, where lack of coordination and mismanagement of funds is an issue within the public sector.

The above highlights that funding for silt management can be sourced from both public[15] and private[16] sectors. Further to this, funding for siltation management can be distinguished into two categories, prevention, and management funding. Prevention funding is used to fund interventions that would typically involve the installation of engineered structures. Management funding refers to funding that is used to manage, prevent, or control the impact at which siltation is occurring. Implemented interventions, i.e. prevention funding, makes use of capital expenditure which involves funding of labour and materials. Whilst operational expenditure is used to fund interventions/structures before and after these have been implemented, which can include funding of baseline assessments before an intervention is implemented as well as monitoring and evaluation after implementation (Van Zyl et al. 2022).

Much focus to decreasing the rate at which sedimentation occurs in South Africa has been directed at addressing environmental degradation. This may be achieved through nature-based solutions such as revegetation of topsoil and implementation of sustainable land use practices to prevent further erosion of the landscape. However, Van Zyl et al. (2022) notes that funding erosion prevention has proven to be globally difficult challenge to implement. A blended finance approach to addressing the limitations associated with siltation management is proposed by Van Zyl et al. (2022), as a possible avenue to explore. This is attributed to the fact that stakeholders in both the public and private sectors benefit from siltation management interventions.

Table 9-6 below provides a range of possible funding mechanisms and sources proposed by Van Zyl et al. (2022) that could be considered for silt and sediment management in terms of EI investment. It is worth noting that, the public funding mechanisms listed are the institutions or facilities through which the funds can be obtained.

[15] Public funding refers to funding sources derived, in this context from national treasury and channelled through governmental programmes.

[16] Private sector funding refers to sources of funding that are not derived from government funding or linked to government funding programmes.

Table 9-6 Possible public and private funding sources for silt and sediment management and EI more broadly in South Africa

Sector	Category	Description	Approach for implementation/example of implementation
Private	Commercial Banks	Commercial banks offer financial and banking services to people and businesses, with the aim of promoting social and economic stability and economic development. In South Africa, private sector investors engage in water related EI investment through loans to companies, farmers, and public institutions such as municipalities and water boards. Furthermore, they buy infrastructure bonds, which are intended to fund long-term infrastructure projects. Although South African financial institutions have become competent in managing project scale risks, variabilities in the currency and liquidity requirements, they still face the challenge of directing funds from the private sector to projects that have financial and socio-economic benefits to both the private and public sector. This is attributed to the limited capability of the public sector to enter into public-private financing agreements. Normally, a Finance Direct Agreement needs to be made between the commercial bank and the government department, which details the risks and returns of the EI investment for both the private and public sector. However, it has proven to be difficult to equally distribute these risks and returns across the private and public sector.	There is no example of implementation provided.
Public	Regional Bulk Infrastructure Grant (RBIG)	This grant is administered by DWS over a 3-year period. The grant is intended to provide financial support for bulk regional infrastructure projects with the intention of ensuring that targets of bulk water and sanitation service delivery are met. This grant provides opportunity for funding to be allocated to siltation management interventions, as the prevention or mitigation of silt build up within bulk infrastructure such as reservoirs, can avoid or reduce costs that would otherwise be incurred through replacing damaged bulk infrastructure. This approach would contribute to water conservation and thus makes a strong case for the RBIG funding to be redirected to silt management interventions. This funding grant is only given to Water Service Authorities such as water boards, local and district municipalities, and municipal companies.	Similar to other Nationally funded infrastructure in South Africa, when a project is sourcing funding from the RBIG grant, it must be included in the municipal Integrated Development Plan (IDP) and Water Services Development Plans (WSDP). Additionally, there needs to be alignment to the projects under the Municipal Infrastructure Grant (MIG) or the Water Services Infrastructure Grant (WSIG). Considering the importance of RBIG fund it is imperative to ensure that the interventions implemented do not result in more environmental damage, but rather reveals the complementary relationship between built and ecological infrastructure. To ensure a better return for investment where water infrastructure is concerned, the cost of erosion prevention and siltation management is necessary.

Sector	Category	Description	Approach for implementation/example of implementation
	Municipal Infrastructure Grants	This is funding attained by local governments, especially metropolitan municipalities from the national budget. Some municipalities have taken more responsibility with regards to water security and environmental health, in line with Section 165(5) of the South African Constitution. There is potential for effective use of this grant if there is acknowledgement of the relationship between built and ecological infrastructure.	An example of this intervention is the eThekwini Municipality's Transformative Riverine Management Programme. The programme is managed through the municipality's Roads and Stormwater Management Department and funds the riparian rehabilitation and river stewardship activities, to protect roads and culverts from damaged thus avoiding repairing costs from being incurred. In 2020, the programme managed to invest R35 million rands in 2020 and created 600 jobs. A projection of the overall cost recovery of the project over 20 years was conducted, which generated R920 million rands.
	Other infrastructure grants: • Human Settlements Development Grants. • Integrated Urban Development Grant (IUDF) in Metropolitan municipalities. • Integrated City Development Grant. • Rural and Community Development Fund (Part of the National Empowerment Fund. • Drought relief grants administered by DWS	Although these grants are not recommended as funding sources for siltation or sediment management, they can support the multiple benefits which are an outcome of siltation management. This can be informed by how the grants are distributed and the careful management of built infrastructure, by ensuring the hard interventions implemented do not result in erosion taking place.	An example of this is the Transformative Riverine Management Project in eThekwini Municipality. As mentioned earlier the programme is run by the Municipality's Roads and Stormwater Management Department. Through the riparian rehabilitation and river stewardship activities the programme aims to protect roads and culverts from getting damaged, thus avoiding repairing or maintenance costs. however, the outcomes of the interventions have also resulted in other socio-economic benefits like job creation.
	Non-infrastructure grants – **Municipal Disaster Grants**	There are two grants that are available and can be used as potential sources to fund siltation management, namely: • **The Municipal Disaster Relief Grant:** this grant is aimed at mitigating the effects of natural disasters of EI. The grant is channelled through the Department of Cooperative Governance and Traditional Affairs. • **The Municipal Disaster Recovery Grant:** this grant is also channelled through the Department of Cooperative Governance	No example of implementation is provided.

Sector	Category	Description	Approach for implementation/example of implementation
		and Traditional Affairs, and the primary purpose of the grant is the rebuilding and rehabilitation of municipal infrastructure that has been damaged by disasters.	
	Comprehensive Agricultural Grant Support	This grant is distributed by the Department of Agriculture, Land Reform and Rural Development (DALRRD). The intention of the grant is to ensure the rehabilitation and construction of EI required to support agriculture. There is potential for the grant to be used to rehabilitate smaller farm dams.	No example available
	'Working' for Programmes	'Working' for programmes receives its funding from DFFE, through National Treasury. The Working for programmes also obtains their funding from the Department of Public Works and Infrastructure (DPWI) through the Expanded Public Works Programme (EPWP), responsible for funding labour wages in the Working for Programmes. Working for Programmes include the following programmes, Working for Wetlands, Working for Land, Working for Ecosystems and Working on Fire managed by DFFE. The programmes are recognised as providing job opportunities, however, are criticised for being ineffective.	A recommended approach to encourage effectiveness of the programme, is the development of common themes which can be focused on, such as siltation management. This would play a critical role of mobilising funding towards strategically protecting reservoir storage capacity and preserving soil fertility. Common themes can also link across other working for programmes, Working for Wetlands, for example the construction of an artificial wetland above dams, would help prevent silt build up within the dams.
	Landcare Programme Grant	This grant is mandated by the DALRRD and is aimed at encouraging the sustainable use and management of natural resources with the goal of ensuring optimal delivery of ecosystem services to human beings. Within this grant, there is opportunity for it to be used for sediment management interventions, as Landcare's focus areas include SoilCare, WaterCare, VeldCare, conservation agriculture and JuniorCare, which are directly related to sedimentation management. Currently, much attention is focused on invasive alien plant removal, where Landcare activities are concerned. The removal of alien plants contributes to the conservation of riparian habitats through reducing water loss and damage of riparian infrastructure such as weirs or bridges. This provides reasoning for the inclusion of silt management practices in Landcare initiatives, as removal of alien invasive plant species can result in riverbank erosion and silt build up.	According to Van Zyl (2022) Landcare plays a fundamental role of supporting South Africa's regenerative agriculture programme. This programme regards the protection of soil cover and build-up of social carbon as critically important to improve the agricultural sectors resilience and profitability (return on investment). Taking this into consideration, there is opportunity to include silt management activities within Landcare initiatives, particularly considering the how the removal of alien invasive plants can lead to erosion. There is therefore potential of implementing the Conservation of Agricultural Land Resources Act, Act 13 of 1983 (CARA) more effectively, through allocating more funds to Landcare activities and garnering funding from the private sector and communal landowners to support regenerative agriculture which prevents dam siltation.

Possible DFI Funding Mechanisms for Siltation Management

Funding from development finance institutions (DFIs) is very common in South Africa and is particularly useful for funding complex or new projects such as siltation management, which traditional development finance often does not take up due to the challenges relating to monitoring and evaluation of presented by uncommon projects (Van Zyl et al. 2022). Traditional financial mechanisms for development financing include grants (which do not requirement repayment), equities, guarantee, insurance, and loans. South Africa has also obtained funding from various traditional DFIs such as the World Bank, the United States Agency for International Development (USAID) and the Green Climate Fund (GCF) (Van Zyl et al. 2022). One of the strengths of the financial mechanisms offered by development banks, is the ability to take financial risks with low returns, which can potentially attract other financial institutions into the market. Majority of the funding mechanisms offered by development banks are generally equity and debt based, with minimal grant opportunities. The grant funding opportunity is usually given as preparation funding for the preliminary stages (planning and pilot phase) of a project. When a project moves from the preliminary stage, the DFI which provided the preparation funding has rights to withhold funding for the implementation phases of the project, which results in a debt and equity funded project (Van Zyl et al. 2022).

Box 5: Definition of development finance institutions (DFIs):

DFIs also referred to as development banks are specialised financial institutions that are created to provide funding and technical support for infrastructural and economic growth.

Table 9-7 below provides an overview of some DFIs or development banks that fund South African infrastructure, however there are new financial mechanisms being developed often, and not reflected here. Further, the table provides potential financial mechanisms within each DFI, that can be explored to fund siltation management and EI more broadly. Although the financial mechanisms proposed are specific to siltation management, there is opportunity to apply these at the broader scale of EI investment.

Table 9-7 Possible DFI and mechanisms for siltation management

Type of DFI funding mechanisms	Description	Potential funding for siltation management
African Development Bank	The AfDB is a multilateral financial provider which provides funding to African governments and private institutions investing in regional member countries. The aim of this financial institution is to contribute to the social and economic wellbeing of countries through this funding.	There are two potential funding mechanisms within the World Bank which can finance siltation management, namely Investment Project Financing and Trust funds and grants. Investment Project Financing is focused on funding activities for built infrastructure aimed at poverty alleviation and sustainable development. In the case of siltation management, there should be significance placed on the role of catchment management in community-based development and institutional building. If DFIs take up the risk of financing new and complex projects, financial institutions will be attracted into the market. An example of such a case is the South Africa's Renewable Energy Independent Power Procurement Programme. Majority of the financial mechanisms offered by DFIs are debt and equity based, with a minimal grant option. The grant option is often allocated to the piloting and implementation phases of a project. The DFI from which the grant was derived has the right to refuse funding phases of the project beyond implementation. often are channelled towards the pilot phases of projects. In the case where the financial benefits of the project cannot be measured, like siltation management, DFIs can sign a first-loss agreements which provides commercial financiers with ease of mobilising funding. **Trust funds and grants** are awarded to government to scale up activities, particularly in disaster-stricken areas. Such projects are managed under the following programmes, Global Water Security and Sanitation Program (GWSP) and the Energy Sector Management Assistance Program (ESMAP). One of the focus areas of the African Development Bank (AfDB) is climate change and the environment. This could potentially be where projects associated with siltation management are placed. The AfDB

Type of DFI funding mechanisms	Description	Potential funding for siltation management
		also manages the Green Bond program, which focuses on funding climate change focused projects, such as biosphere conservation projects, which aim to minimise the degradation of ecosystems and emissions related to deforestation. Similar, to the AfDB, this is where siltation management projects can be placed and funded.
New Development Bank	Previously known as Brazil, Russia, India, China, and South Africa (BRICS) Development Bank, this financial institution provides funds to primarily developing countries and private sector or growing companies within developing countries and BRICS member countries. Represented. The financial institution funds a range of themes within South Africa, which include but are not limited to the following themes, clean energy, transport infrastructure, irrigation, minerals and raw materials and agriculture.	**No potential financial mechanisms we identified under this financial institution to fund siltation management in literature**. However, it can be placed within the water resource management and sanitation scope of the funding categories of interest in South Africa. It is also open to both p
Eastern and Southern Trade and Development Bank	The Eastern and Southern Trade and Development Bank is a financial institution that provides financing to member states or countries closely located to the member states. It also provides funding for African or non-African institutions. Specific key focus areas include petrochemicals, petrochemicals, agriculture, and communication infrastructure.	**No specific information found.**
Development Bank of South Africa (DBSA)	Provides equities and loans to public institutions such as Petrochemicals agriculture, raw materials, and energy. Additionally, the financial institution provides funding to private organisations who have been given a license on a competitive basis within the DBSAs mandate. The specific categories of interest in South Africa include transport, energy, water and sanitation and Information and communications technology.	***No specific information found in the literature.*** However, there is potential to include siltation management within the broader category pf water and sanitation.
Climate Financing	Refers to funding that is allocated to and contributes to climate change mitigation and adaptation strategies. Such interventions are targeted at reducing greenhouse gas emissions, mitigate risks associated with climate change related disasters on humans and the environment, maintain and improve the resilience of human and ecological systems towards climate change impacts.	The Green Climate Fund (GCF) assists countries meet their Nationally Determined Contributions and obligations, made as part of the Paris Agreement. GCF projects focus on three (3) strategic areas, namely: • **Climate change mitigation**: these are interventions or projects that aim to minimise emissions of greenhouse gases and improve the resilience of carbon sinks.

Type of DFI funding mechanisms	Description	Potential funding for siltation management
	This financial mechanism aims to achieve this, by aiming to achieve development through capacity building, research, and economic development. The following are examples of international climate financing facilities, namely, Climate Investment Fund, Global Environment Facility, Green Climate Fund, Adaptation fund and the loan from the European Investment Bank.	• **Climate change adaptation** focuses on the most vulnerable communities to climate change related disasters. **Cross-cutting projects** are project that focus on both mitigation and adaptation interventions. In the case of siltation management, there is potential for it to be incorporated into both the climate change mitigation and adaptation strategic areas, through interventions such as veld management, natural grassland management, wetland rehabilitation, clearing of alien vegetation, conservation agriculture and agroforestry.
Bilateral development agencies	These are financial institutions that fund projects that contribute to the economic and social wellbeing other countries. Bilateral development agencies or finance institutions are either independent or are part of a larger international financial institution. There are a range of bilateral agencies that exist, and all of them obtain their donations from high income countries. Further, the funding from these agencies is channelled through NGOs and not directly to government institutions. Due to South Africa being a middle-income country, it is often not funded through bilateral development agencies, however, the few that do include, the German Development Agency (GIZ), French Development Agency (AFD), Finnish Development Agency (FINNIDA) and the United States Aid Agency (USAID) to name a few.	Due to the small funding obtained from bilateral development agencies, and is thus used to fund smaller, local projects. Although the funding is quite small, it can still be valuable to use for catchment specific intervention projects, which can potentially include siltation management.

ENABLERS AND CONSTRAINTS TO EI INVESTMENT

This section provides an overview of the factors that enable and constrain EI investment at a local, national, and global level. It should be noted, that throughout the project, it is anticipated that additional enablers and constraints will be synthesised from the four case studies, further expanding on the items below.

Constraints to EI Investment

Letley and Turpie (2023) identify several barriers to water-related EI investment, the most common ones being:

(a) The public nature of ecosystem benefits (goods and services): The ecosystem services provided by nature are for the public benefit and use. Currently, most of the EI investment in South Africa has been funded by the public sector. Similarly, this is the case for EI interventions, in which the outcomes of the intervention become public goods and services. However, the public nature of these goods and services generally poses a challenge when trying to secure investment from the private sector. Resultantly, the private sector under invests in EI as they are unable to measure or control their return on investment (Letley and Turpie, 2023).

(b) Lack of immediate financial return on investment in EI rehabilitation by investors: Where EI projects are concerned, the return on investment or desired outcomes are often realised over an extended period of time and are not always easily translatable into financial outcomes, *e.g.* Like water quality or quantity despite its role in securing economic development. For private investors, this is often considered to be undesirable, due to having to report on the financial return on investment. Subsequently, most investors have suggested that alternative sources of income should be identified for EI projects (Letley and Turpie, 2023).

(c) Lack of financial coordination and distribution of funds: Insufficient institutional capacity and coordination at a catchment level, makes it difficult for EI investment funds to be distributed timeously and effectively across implementing agencies. Subsequently, funding is often distributed through government-led programmes or projects such as the NRM, or non-profit organisations (NPOs). In many instances the projects/programmes are not well coordinated and disorganized. Thus, a more coordinated and well-functioning structure is required at a catchment level to overcome this barrier. An example of a catchment level structure that can be applied is a catchment wide partnership like the uMngeni Ecological Infrastructure Partnership (UEIP) (Letley and Turpie, 2023).

(d) Lack of motivation to pay beneficiaries: Some of the major beneficiaries of catchment restoration in South Africa include large industrial users, bulk water suppliers such as municipalities, and irrigation water users. Despite this, the abovementioned beneficiaries, do not prioritise investing in catchment restoration or management. This is attributed to the fact that municipal water suppliers face challenges, like mismanagement of funds, unaccounted for water bills, lack of capacity in the form of labour and skills, and a poor understanding of the ecosystem services derived from natural capital. Furthermore, it is often the case that, a catchment is serviced by different municipalities restricting funding for catchment restoration to specific boundary. However, there have been examples of funding activities outside of

spatial boundaries, such as the City of Cape Town Water Fund which funded the restoration of the mountainous catchments (Letley and Turpie, 2023).

- **Prohibitive costs associated with EI projects**: EI projects are often regarded as being too expensive to invest in, which is often the case in severely degraded landscapes that require the adoption of active restoration and implementation of sustainable land use practices. Active restoration is often followed by conservation measures, including sustainable land use management or establishment of protected areas which require maintenance contribute to EI restoration/rehabilitation costs. An example of this, are the costs associated with clearing IAPs and rehabilitating degraded grasslands (Letley and Turpie, 2023).

Box 6: Definition of Active Restoration:

Active restoration is often applied within areas that have been heavily degraded and includes the implementation of rehabilitation activities such as clearing of IAPs, replanting or reseeding areas that have been deforested or uncovered or earthworks such as stabilisation work to fix erosion gullies and wetland rehabilitation (Letley and Turpie, 2023).

(e) Difficulty in securing legal rights to property or land: Land tenure can be a major challenge to secure long-term investment in EI or pose a risk to the sustainability of an EI project. Complex land tenure can inhibit the uptake of sustainable land use practices which are often long-term, due to the lack of assurance regarding the ownership of land (Letley and Turpie, 2023).

(f) Poor information and communication: Baseline data is an important form of information to have to build a convincing business case for EI investment or lobbying for ongoing investment in EI. This data is time consuming to develop and often a lacking element within EI projects. Communication of the critical importance of EI and the vital role it plays in water security is often missing (Letley and Turpie, 2023).

Several of these barriers were also identified in the SEBEI project (Rebelo and Methner, 2019). Specifically, critical barriers to EI investment noted by the stakeholder and investor groups in the SEBEI project included poor governance, poor planning and coordination, lack of empirical evidence of socio-economic benefits of EI investment, lack of finances, limited communication (and/or terminology not easily understood or familiar to the range of stakeholders), and a lack of capacity and resources to implement the EI investment (Rebelo and Methner, 2019).

Developing countries face a range of challenges relating to sourcing funding/investment in EI interventions, primarily due to the lack of evidence supporting the proposed EI interventions. Although small-scale interventions have become popular globally, the lack of context specific evidence of the benefits of EI investment, makes it difficult to secure funding to upscale these interventions (Robelo et al. 2021). Robelo et al. (2021) notes an important point, which documenting the benefits of EI interventions is critical in lobbying for further investment in EI interventions. Additionally, the financial returns of EI investment and understanding the preferences of investors, is paramount in securing investment in EI, particularly from private sector investors (Rebelo et al. 2021).

South Africa faces a range of environmental challenges, related to water security. Concerning this, the government has made extensive investment in EI interventions with a particular focus on increasing water access, availability, and job creation.

Enablers to EI Investment

This section provides a summary of several enablers identified both locally and internationally which can enable water-related EI investment. Additionally, it draws from enablers briefly introduced in **Table 6-2,**which are presented in further detail below.

(a) Linking 'Green' and 'Grey' investments through project finance: Integrating green and grey infrastructure could potentially reduce costs associated with implementing and maintaining EI projects. According to Waryszak et al. (2021), maintenance and construction costs for green infrastructure are lower compared to the costs of ongoing maintenance and construction of grey infrastructure. Browder et al (2019) notes that while natural EI that is fully established (reached a level of ecological maturity) is resilient to climate change related weather events, such as floods and drought, the reliance on green EI solely which is not yet matured (ecologically stable) is vulnerable to the intensity of climate change related weather events. Thus, the hybrid approach (integrating green and grey infrastructure) is regarding as a more cost-effective approach to EI investment, that allows for enhanced resilience of EI, with minimised environmental risks. This is attributed to the implementation of nature-based solutions through improved conservation or rehabilitation efforts and the robustness offered by grey infrastructure. Additionally, through integrating grey and green infrastructure there is potential to leverage funding from both the private and public sector.

- An example of a hybrid approach to sustainable water quality management and conservation, is the Espirito Santo Integrated Sustainable Water Management Project, which began in 2014 and ended in 2021. The project was aimed at addressing water quality challenges attributed to poor sanitation service delivery and erosion faced by the state of Espirito Santo in Brazil. This was conducted through implementing EI interventions within critical water provisioning catchments in south-central Espirito such as the Jucu and the Santa Maria da Vitoria Rivers catchment which makes up 9% of the region and the Mangarai River catchment, which is the major source of silt build up, affecting the Santa Maria and Carapina treatment plants. The rapid growth in population due to urbanization in the Espirito Santo region made it difficult for the Greater Vitoria Metropolitan Region, and subsequently built EI such as wastewater treatment plants to meet the growing demand of water access, sustainable management of water quality and proper sanitation delivery. To address the challenges of high levels of erosion within critical catchments and deteriorating water quality attributed to siltation, the Mangarai River Pilot project was enacted under the broader Espirito Santo Integrated Sustainable Water Management Project which implemented interventions such as reforestation and improved land use practices to reduce erosion and thus the rate of sedimentation. Additionally, the broader project implements increased wastewater collection and treatment services, which are aimed at lessening the burden on wastewater treatment plants (Browder et al. 2019). The abovementioned interventions contribute to reducing the burden on built EI, in this case, the maintenance costs associated with repairing filtering equipment of wastewater treatment plants due to damage from silt build up. It is evident

through this example that a hybrid approach to EI investment is effective as EI is able to complement built EI, especially when it is failing to function as it should (Jewitt et al. 2020).

(b) Water Risk Assessment Tools: Water risk assessment tools are used by companies or organisations to assess their water risk, as related to the company's operational activities and supply chain. Through the information derived from these tools, companies are able to make informed decisions and develop strategies to manage the available water resources they have sustainably. An example of a water risk assessment tool that is widely applied is the WWF Water Risk Filter, which was developed to help private sector businesses and organisations assess and identify water risks. Water risk assessment tools such as the WWF Water Risk tool, drives companies to take action in relation to sustainable water stewardship and management (Laporte-Bisquit, 2021).

(c) Developing a business case for EI investment through research: The development of a strong business case for EI projects which explicitly highlights the monetary value of the ecosystem returns of an EI initiative has potential to attract large-scale private sector investment into EI, which is a major gap in South Africa (Rebelo et al. 2021). Research can foster a conducive environment to assess and document financial and non-financial benefits of EI investment projects, which can contribute to developing a stronger evidence base for to encourage private sector to invest in water-related EI (Browder et al. 2019).

(d) Task Force on climate-related financial disclosures: The TCFD is a global framework which provides guidelines and recommendations to encourage industries and organisations to evaluate and report explicitly on climate related risks within their financial reporting processes. Although this initiative does not directly relate to water-related EI, the impacts of climate change, directly affects water security. For example, climate change related weather events, such as droughts/floods, which threatens water security and quality, poses a serious financial and operational risk to industries and organisations. Through financial reporting on climate related risks, investors, funders, managers, and insurers make more informed decisions thus reducing business related risk (TCFD, 2021; NBI, 2019). With investors being more inclined towards investing in companies that are environmentally responsible, there is potential for TCFD to be a driver of helping companies shift form profit driven motives to being environmentally responsible and climate resilience (NBI, 2019).

(e) Enabling environmental agreements: International environmental agreements such as the Sustainable Development Goals (SDGs) (SSA, 2019) and the Paris Agreement (UNICEF, 2020) encourage companies and organisations globally to make a conscious effort in conserving, protecting, and mitigating the impact of their activities on the environment. For example, the SDGs call countries into action through encouraging them to adopt practices that will contribute to creating a sustainable and healthy environment for all (Browder et al. 2019). SDG 6, which focuses on ensuring equitable water access and sanitation for everyone has led to many countries adopting policies and regulations that align with meeting this goal. The Green Drop certificate program is an initiative that assesses the performance of wastewater treatment plants across municipalities in South Africa against established standards of excellence that comply with environmental regulations such as the National Water Act. The aim of the initiative is to challenge municipalities to improve the overall functioning of their wastewater treatment plants, which subsequently contributes to sustainable water management (DWS, 2022). Furthermore, the Green Drop certification program contributes

to Target 6.3 of SDG 6, which is aimed at improving water quality through improved wastewater management thus reducing water pollution (SSA, 2019).

(f) Public-Private Partnerships: (PPPs): China's National program on sponge cities which is an initiative aimed at addressing the water scarcity faced in urban areas due to a rapid rate of urbanization, which is projected to be at 70% by 2035. Through the Sponge City initiative, collaboration of private and public sector in urban related EI investment is encouraged (Browder et al. 2019). According to Browder et al. (2019) technical support and funding through government is provided for EI investment projects within the sponge city initiative, which is also supported through private sector funding.

(g) Drought and water crisis: Climate change related weather events such as drought which leads to water insecurity can be a catalyst for businesses to assess their water risk and provide opportunities for businesses to develop strategies to mitigate or minimize those risks. This can propel some companies to invest more actively in water-related EI (NBI, 2019). An example of drought being a catalyst for water-related EI investment, is the GCTWF, which was developed as a response to the water crisis faced in Cape Town due to the prolonged drought experienced in 2018. The GCTWF framework implements nature-based solutions to ensure water security (TNC, 2022).

(h) Economic policy instruments and payment for ecosystem services mechanisms: Ecological infrastructure supports the delivery of ecosystem goods and services that are socially and economically essential, such as water supplies, natural products, tourism and recreational amenity, and protection from climate change impacts such as flooding and drought. Developing economic policy instruments and associated organising mechanisms that enable ecological infrastructure investment is key. Economic policy instruments and/or market-based instruments such as Payment for Ecosystem Services can be effective to facilitate sustainable investment in the restoration and management of EI at the local-level (Mander and Mander, 2021).

PART B: CASE STUDIES

EI INVESTMENT CASES FROM SOUTH AFRICA

This section focuses on EI investment cases from South Africa, which are documented in **Table 9-8**. It is not intended as an exhaustive review of South African cases, but rather to represent a diversity of South African EI investment cases for which existing information is available. The cases were selected to represent a wide variety in terms of type and scale of the investment/intervention; land-use context; primary funder(s); partnership arrangements; and ecosystem services affected. The nine (9) case studies presented in **Table 9-8** encompass a wide range of scenarios both in terms of scale and complexity of partnership arrangements.

For example, the Greater Cape Town Water Fund (GCTWF) is a formalised initiative, which comprises a comprehensive formalized partnership with a Board and Directors, specific legal agreements/mechanisms, a long-term strategic plan, annual operating plans and a comprehensive monitoring and evaluation programme. Establishing this formalised multi-stakeholder partnership required a considerable amount of investment over a period of more than two years to provide a sound base for the large-scale interventions to follow.

The Klein Swartberg initiative, on the other hand, is an initiative that is based on an informal partnership and has developed organically over time with a sequence of small-scale interventions. Nonetheless, the initiative is working towards long-term objectives and specific operational targets that have been set and are monitored annually.

In between these two vastly different initiatives is the Skoon Veld initiative in Ceres. This initiative also included the upfront establishment of a formalised partnership, but involved fewer partners, as it is largely a bilateral agreement between the Ceres Business Initiative and the Ceres Local Municipality.

In **Section 9** four cases studies covered in Table 8-1, namely 1) The Mpophomeni Initiative, 2) the uMhlangane Initiative, 3) the Klein Swartberg Initiative, and 4) the Wolseley Water Users Association EI coordinator Initiative, are described in more detail.

Table 9-8 Examples showing the diversity of types, financing arrangements, and scales of EI investment initiatives in South Africa

Factors	uMhlatuze Water Stewardship Programme	The Nature Conservancy (TNC) Greater Cape Town Water Fund (GCTWF)	Program Skoon Veld - Ceres	Upland River Conservation	The Endangered Wildlife Trust Carbon for Conservation Project	Sihlanzimvelo / TRMP (eThekwini)	uMhlangane /Riverhorse Valley	Mpophomeni	Klein Swartberg	Wolseley Water Users Association
Type of EI investment	Public and private sector investment in catchment management, which includes enhancing the management of the freshwater coastal lakes and surface water dam, supporting water use efficiency, facilitate agricultural water stewardship, securing EI and developing community water related champions.	Public-private partnership to facilitate major investment from multiple funders to manage catchments with nature-based solutions, primarily through measures to control invasive alien plants for water security	A private-sector driven partnership to control IAPs in the mountain catchment supplying the Ceres area with water recognized as an economically critical resource.	Private-sector driven riparian rehabilitation in the upper uMngeni catchment. Efforts focus on enabling EI rehabilitation and conservation activities which would not normally be financially sustainable for landowners but would benefit the catchment.	Private-private partnership. A sustainable financing mechanism (carbon-offsetting) is used to invest into improved grassland and wetland management.	Initiated with public funding through the municipal Opex budget, then expanded through DFI grant funding.	An example of cooperative rehabilitation and management of a freshwater EI within an urban landscape, involving investment by public and private sector, civil society organisations.	Public investment in the rehabilitation of the Mthinzima Wetland complex as part of built infrastructure development.	Local businesses and farmers investing in the mountain catchment EI on which their water security depends	Public and private sector investment in EI maintenance through a dedicated EI coordinator appointed into a local institution
Water risk factors	Drought	Water security in the context of assured water supply in a variable climate.	Water security (assured quantity)	Adverse effects for recreation (fishing), erosion and land productivity, downstream water security.	Water quality and quantity in SWSAs.	Flood attenuation / risk management and water quality.	Flood risk reduction and water (quality) security in the context of a highly urbanized catchment area	Water (quality) security in the context of mitigating pollution sources from formal and informal settlement in a key water supply catchment	Water (quantity) security in the context of assured water supply in a dry and variable climate.	Primarily water (quantity) security in the context of assured water supply. Also, including natural flood conveyance, and therefore flood risk
Scale	Medium	Large	Medium	Medium	Very large.	Medium	Medium	Small	Small	Medium
Catchment	uMhlatuze Catchment	Multiple catchments supplying the Greater Cape Town area	The catchment supplying Ceres Town	The Upper uMngeni catchment (highland areas), expanded into the broader eastern Drakensberg drainage region.	Multiple strategic water source areas.	uMhlangane catchment, located in the Lower uMngeni catchment.	uMngeni	uMngeni	Gouritz	Breede
Land use context	Urban (Commercial residential, industry), rural areas,	Predominantly rural mountain catchment areas, but including some urban areas	Rural mountain catchment areas	Predominantly commercial agriculture.	Agriculture with significant grazing component.	• Urban (commercial, residential, industry). • State, municipal, and private land ownership.	• Urban (commercial, residential, industry). • State, municipal, and private land ownership.	Rapidly expanding residential – informal and formal.	Agricultural, undeveloped, and small town.	Agricultural, primarily irrigated fruit production.
Primary funder(s)	• GIZ • NBI • WWF South Africa	Multiple private and public funders (see partners below)	Predominantly local businesses, but also government funding through the municipality, and some additional funding from WWF's Green Trust	• Natal Fly Fishers Club (NFFC) through fundraising activities • WWF South Africa • Landowners - volunteer and in-kind contributions	The revenue is earned not funded, through the sale of carbon units.	DFIs (AFD) and public sector (eThekwini Municipality)	DFIs, public and private sector: eThekwini Municipality, DFIs (AFD, EU/GIZ), Private sector/business	Public sector, NGOs, and civil society: Public and The Department of Economic Development, Tourism and Environmental Affairs, uMgungundlovu District Municipality, Umgeni Water, citizen scientists, NGOs	Private and volunteer sectors: Local businesses in Ladismith and the Gouritz Cluster Biosphere Reserve, plus in-kind contributions by Mountain Club of South Africa (through which the participation of volunteers is promoted), and local	Private and public sector: Woolworths, Coca-Cola, LandCare, Department of Environmental Affairs and Development Planning, Western Cape Government, and Breede-Olifants Catchment Management Agency

Factors	uMhlatuze Water Stewardship Programme	The Nature Conservancy (TNC) Greater Cape Town Water Fund (GCTWF)	Program Skoon Veld - Ceres	Upland River Conservation	The Endangered Wildlife Trust Carbon for Conservation Project	Sihlanzimvelo / TRMP (eThekwini)	uMhlangane /Riverhorse Valley	Mpophomeni	Klein Swartberg	Wolseley Water Users Association
								(WESSA, DUCT), Working for Wetlands, local catchment management and conservancies forums, Ezemvelo KZN Wildlife, and research entities	farmers from the areas surrounding Ladismith.	
Current Partnerships	**Civil society, government, and industry**: Government: Department of Water and Sanitation, Transnet, Tongaat Hullet, Richards Bay Minerals, Mondi South Africa, Proto-CMA Pongola Mzimkulu, Grindrod and WWF	The Nature Conservancy, Department of Water and Sanitation, Department Forestry Fisheries of Environment, provincial Department of Environmental Affairs and Development Planning, City of Cape Town, South African National Biodiversity Institute (SANBI), CapeNature, Coca-Cola Peninsula Beverages, Nedbank, Remgro Ltd and WWF.	Led by Ceres Business Initiative (CBI) and involving several individual businesses belonging to the CBI, and closely partnered and co-managed with the Ceres Local Municipality	Initial partnership between the Natal Fly Fishers Club (NFFC), local landowners and the WWF. Now led by Upland River Conservation (NPC), involving several local businesses, conservancies, landowners, National Government (NRM programme), and additional partners in projects beyond the uMngeni catchment.	Large numbers of private landowners, mostly all linked to Biodiversity Stewardship sites (Protected Environments and Nature Reserves) and WeAct, a carbon project developer.	• Private Sector /Business • NGOs • Civil society / Community based organisations • Municipality	• Private Sector /Business • NGOs • Civil society • Municipality	• Private Sector /Business • NGOs • Civil society	• Local business • Civil society (farmers) • Mountain Club of South Africa • Cape Nature • Gouritz Cluster Biosphere Reserve	• WorldWide Fund for Nature (WWF) • Wolseley Water Users Association • Breede-Olifants Catchment Management Agency • LandCare
Key/focus ecosystem service(s)	• Improve water security for businesses, industries, forestry, agricultural producers, and communities. • Management of critical water sources in the catchment • Wetland rehabilitation and alien invasive species clearing • Securing EI	Restoring the ecological infrastructure of priority sub-catchments through invasive alien plant removal as a cost-effective and sustainable means of augmenting water supply for the Greater Cape Town Region.	Controlling IAPs in a key water supply catchment for improved assurance of water supply and to maintain the biodiversity of the mountain fynbos	Improved recreational (fishing) opportunities, securing downstream water supply, enhanced/secured land productivity.	Grassland and wetlands. Some restorative action in both grasslands and wetlands.	• Provisioning (water quality and quantity) • Regulating (flood attenuation)	• Water flow regulation/flood attenuation • Biodiversity conservation through habitat protection and enhancement • Water Quality	• Water quality enhancement	• Water supply and regulation	• Water supply and regulation
Year implementation started	2016	2018	2017	2017	2022	2009	2014	2015	2019	2017
Monitoring	• Alien invasive clearing • Wetland rehabilitation	Catchment areas cleared of IAPs are monitored and evaluated to demonstrate impact	Clearing operations are monitored and quality checked by the municipality to determine if work is satisfactorily completed	Length and area of clearing and revegetation activities recorded, monitoring for regrowth of invasive vegetation,	• Veld condition assessments, • Application of management practices, specifically those	• Clearing and clean-up work undertaken by the cooperatives is monitored by the Municipality.	• Endangered Wildlife Trust (EWT) were involved in monitoring following the	• GroundTruth citizen scientists (EnviroChamps) were responsible for post wetland monitoring	• Mountain areas cleared of IAPs are monitored by volunteers and a SAEON developed app is used	• Primary monitoring by the EI coordinator and by various other partners, including LandCare.

Factors	uMhlatuze Water Stewardship Programme	The Nature Conservancy (TNC) Greater Cape Town Water Fund (GCTWF)	Program Skoon Veld - Ceres	Upland River Conservation	The Endangered Wildlife Trust Carbon for Conservation Project	Sihlanzimvelo / TRMP (eThekwini)	uMhlangane /Riverhorse Valley	Mpophomeni	Klein Swartberg	Wolseley Water Users Association
				water quality monitoring (river monitors sponsored by local business).	related to fire, grazing, and soil organic carbon.		introduction of the Pickergill's Reed Frog. GroundTruth was responsible for specialist monitoring undertaken during the rehabilitation activities.	activities, while GroundTruth provided the pre rehabilitation monitoring.	annually to rapidly estimate the water savings associated with the clearing	

FOUR SOUTH AFRICAN CASE STUDIES

The following section provides a review of four South African cases (**Figure 9-4**) identified to inform and further refine the framework development process. As part of the inception phase of the project, a suite of key questions were developed to assist in the case study review, stakeholder engagement process, and eventually the development of the framework. These questions included:

9. What are the quantifiable ecosystem service returns (outputs and outcomes) from EI interventions associated with the implemented initiatives, especially those services related closely to water security?
10. Which role-players were involved in the respective aspects of planning, funding, and implementing EI investments?
11. How relevant are the returns described earlier to key role-players, in particular for private sector role-players?
12. Which funding mechanisms were applied and how did these develop? What criteria, if any, did the initiative need to meet in order to secure the funding.
13. How was the funding structured (organized, designed or set-up) i.e. What type of funding e.g. donations, loans, and repayments etc.
14. What is the business case for private sector investment in water-related EI within the initiative and how was this developed and communicated amongst the role-players?
15. To what extent has the EI investment contributed to social justice?
16. What key lessons were learnt from the initiatives and, taking these lessons into account, how scalable is the case?

The expanded description of the cases was informed by the guiding questions which were further refined and applied during the preliminary stakeholder engagement and literature review process. The stakeholder engagement process included semi-structured interviews with key role players and stakeholders, identified through the preliminary stakeholder database, which was informed by the working group. It is worth noting that these cases will be further synthesised and refined throughout the course of the project as more information/details become available through additional engagement processes. Additionally, systematic screening of the cases to identify key enablers, constraints, and other lessons still needs to be undertaken but is subject to receiving additional data/information through the stakeholder engagement process. For the purpose of this deliverable, the case studies have been presented based on the guiding questions.

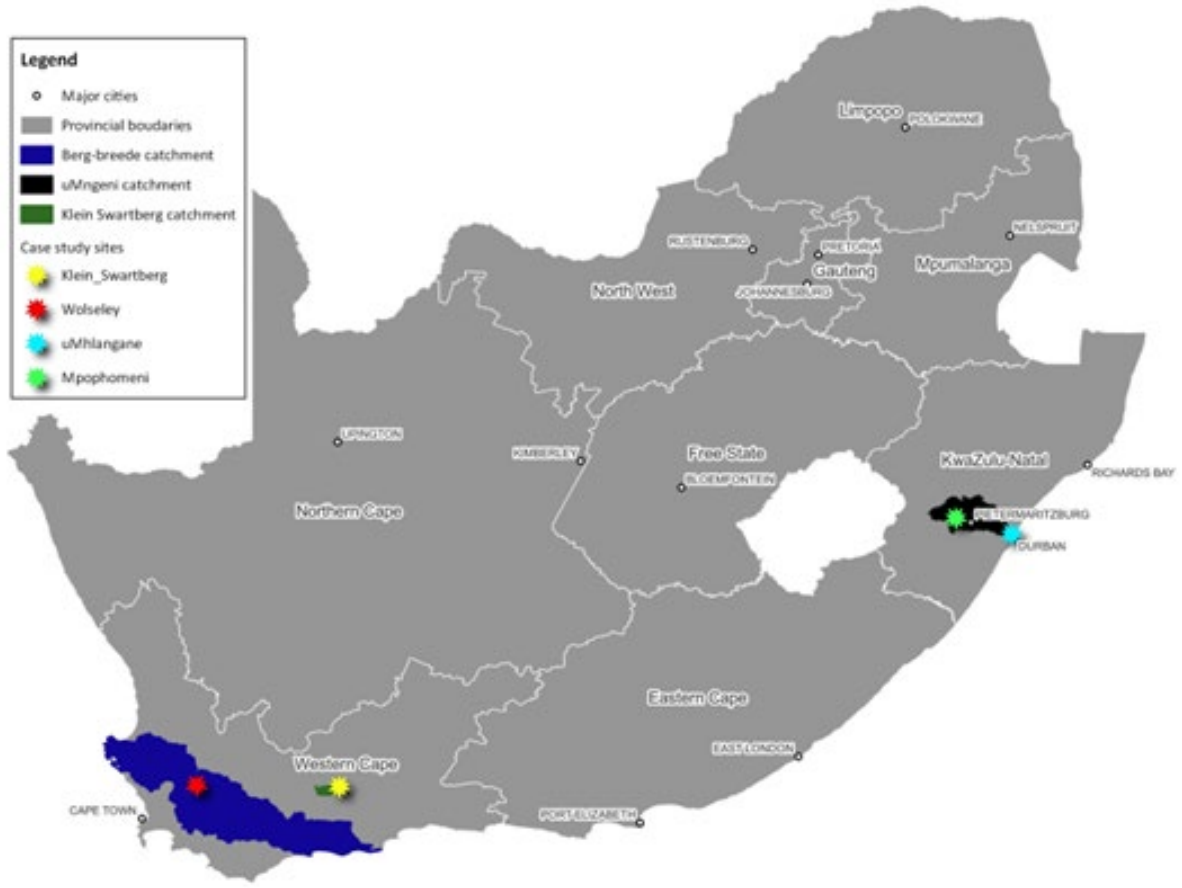

Figure 9-4 Overview of the four case studies

The Mpophomeni (Upper uMngeni) Initiative

This case focuses on the Mpophomeni-Mthinizima Stream initiative, located in the upper uMngeni catchment in KwaZulu-Natal. The initiative is aimed at improving and maintaining the water quality of the Mthinzima Stream through wetland rehabilitation, improved grey infrastructure and raising environmental awareness and citizen science action (Browne and Mugwedi, 2017). The Mthinzima Stream runs through, and downstream of the Mpophomeni housing settlement and flows directly into Midmar Dam (a key water reservoir within the regional water supply network) (Ward, 2016). The settlement forms part of the largest area of high-density housing within the upper uMngeni catchment and is within close proximity to Midmar Dam. The Mthinzima Stream catchment, comprising mostly of the Mpophomeni settlement, has a history of poor water quality with *E.coli* levels significantly higher than target water quality ranges. According to Lotz-Sisitika et al. (2018), in 2014, "Mpophomeni contributed 51% of the E.coli and 15% of the phosphorus load in Midmar" (p. 33).

Drivers of poor water quality in the system include (interrelated) (Felton 2024; Jewitt et al. 2020; UMDM 2016):

- Failing and in-sufficient wastewater and stormwater infrastructure.
- Ineffective/missing solid waste collection systems.
- Mis-use of wastewater/sewer infrastructure by residents of Mpophomeni.
- Degraded ecological infrastructure (wetlands and riparian areas) (intensive livestock grazing, contaminated water inputs, encroachment of alien invasive vegetation, and channel and flow modifications).

The wetland system associated with the Mthinzima Stream has been significantly degraded/impact due to anthropogenic impacts. However, even in this degraded state, water quality monitoring results showed that the wetland was having a positive influence on water quality enhancement. Ecological assessments indicated that this influence could be increased through the active rehabilitation of the wetland, thereby enhancing the overall functioning of the system (Jewitt et al. 2020). However, this would be subject to input from a suite of stakeholders.

A consortium of stakeholders has been and are involved in the Mpophomeni-Mthinizima Stream initiative. This includes the uMgungundlovu District Municipality (government), Umgeni Water (government), local community citizen scientists (commonly referred to as EnviroChamps), local

Box 7: Origin and development of the initiative

The Mpophomeni-Mthinzima initiative came about through the convergence of several developments occurring at the time. The main elements of these and some of the key milestones are outlined below (Felton, 2024; UMDM. 2016.).

During 2010/2011, attention to the water quality in the uMngeni system increased from several groups. eThekwini Metro Municipality and Umgeni Water were concerned about the rising costs associated with the purification of water. Organizers, participants, and the media raised concerns regarding declining water quality and health implications for Duzi canoe marathon participants. Researchers, practitioners, and organizations (e.g., SANBI), were increasingly investigating and raising awareness about the linkages between the condition of EI, catchment use and management and water security (quality and quantity) implications. This attention, along with declining water quality in many of the systems of the uMngeni catchment and the rising demand for water catalysed the formation of a catchment-wide partnership, the Umgeni Ecological Infrastructure Partnership (UEIP), in 2013. The initial development of the partnerships was led by several organisations including the South African National Biodiversity Institute (SANBI), eThekwini Metropolitan Municipality, the KwaZulu-Natal office of the Department of Water and Sanitation and Umgeni Water.

After further consideration, the scale of the initiative was recognized as too large for a 'demonstration site'. The Mthinzima Stream was identified as a suitable focus area for several converging reasons, both from a biophysical perspective, but also from the strong potential for multi-sector collaboration, through:

- An opportunity to collaborate with, and support, the Mpophomeni Sanitation and Environment Programme (MSEP) (which has since evolved into the EnviroChamps model) in response to waste management challenges in the Mpophomeni Settlement (solid waste management challenges and frequent sewer blockages and spills) (NGO led partnership);
- The planned construction of a new Wastewater Treatment Works (WWTW) in Mpophomeni and the potential to integrate/align grey infrastructure development and EI investment. The building of the WWTW came about from the proposed development of a new residential settlement near Mpophomeni (the Khayalitsha Settlement) and pressure on the existing waste-water infrastructure systems. The WWTW was included as a condition of approval for the new development; and
- An active Upper uMngeni Catchment Management forum, which were 'looking' at EI investment options and had identified the Mthinizima wetland.

landowners (tribal/community trust), Wildlife and Environment Society of South Africa (WESSA), Duzi-uMngeni Conservation Trust (DUCT) (NGOs), NRM - Working for Wetlands (government programmes), GroundTruth (private – consulting), local catchment management and conservancies forums and other partners of the uMngeni Ecological Infrastructure Partnership (UEIP), which is convened by SANBI.

Through the UEIP, an initiative was established to create and support three EI investment demonstration sites within the Greater uMngeni Catchment. These were to be funded through donor funds, initially GEG 5 funds, channelled through SANBI's Biodiversity and Land Use (BLU) project. The Upper uMngeni Catchment was identified as one option and, initially, the 'Save the Midmar Dam' initiative was conceptualized which would encompass the Midmar Dam catchment and be championed by the uMgungundlovu District Municipality (UMDM) through pro-bono support of a 'UMDM co-ordinator'. The initiative initially aimed to address a range of the drivers of poor water quality through several strategies.

A strategic plan was developed (by the UMDM co-ordinator with stakeholders) to tackle water quality related issues in the Mthinzima Stream address. It was recognized that this would require action across multiple focus areas and a need to co-ordinate across these with specific attention to built/grey infrastructure and EI linkages. The focus areas included:

- Management of sewer spills in the Mpophomeni Settlement.
- Sewer infrastructure challenges in Mpophomeni, recognizing that it would not be realistic to address this completely through the initiative given the major structural challenges of the existing infrastructure, but to look for opportunities.
- Sanitation and environment awareness raising and capacity building, supporting the work by DUCT and WESSA, which had achieved strong traction.
- Solid waste management (uMsunduzi Local Municipality).
- EI rehabilitation (Mthinzima wetland complex).

Out of these focus areas, the 'sanitation and environment awareness raising and capacity building' and rehabilitation of the Mthinzima Wetland developed the most traction.

The original Mpophomeni Sanitation and Environment Programme (MSEP) developed into the EnviroChamps initiative, which has been running for over 10 years and funded through a variety of ways over the years (discussed further in later sections).

The wetland rehabilitation component of this case description encompasses the interventions implemented for two different portions of the 'Mthinzima Wetland complex' each funded and managed separately and involving different role-players. An overview of the two projects is provided in **Table 9-9**.

Table 9-9 Overview of the two Mthinzima Wetland Rehabilitation projects

	Mpophomeni WWTW wetland rehabilitation	Mthinzima Stream Wetland rehabilitation
EI type	Channelled valley-bottom wetland	Channelled valley-bottom wetland
EI intervention	Wetland rehabilitation and on-going maintenance	
Objective	Enhance the ecosystem services specifically associated with water quality of the wetland	
Landowner	State	Communal Land (Trust)
Driver (of the rehabilitation investment)	A condition of the Environmental Authorisation (2014) for the WWTW and associated reticulation (pipeline)	UEIP Demonstration Site
Role-players	UMDM Umgeni Water	UMDM, SANBI, DUCT/WESSA, GroundTruth, Umgeni Water
Funders	District Municipality	Multiple, funders and fund sources varied over the project life. Different sources of funds for different aspects (hard/soft interventions, monitoring). No funds directly from private sector companies or civil society.
Fund types	Public (state) funds	Donor grants In-kind contributions
Planner	Consultant (GroundTruth) – as part of EA process (2014 & 2015)	Consultant (GroundTruth) – pro-bono (2015)
Implementer and implementation timeframe	*[To be confirmed through further stakeholder engagements]*	Eastern Wetlands 2017 - 2019

The findings of the stakeholder engagements and document reviews undertaken to date are presented below in response to the 'case study guiding questions. This will be further refined throughout the course of the project as more information/details become available through additional engagement processes.

1. <u>What are the quantifiable ecosystem service returns (outcomes) from EI interventions associated with the implemented initiatives, especially those services related closely to water security?</u>

Outcomes:

- There has been a restoration of wetland specific bird species in the Mthinzima wetland, such as herons and egrets, which had relocated from the wetland due to its degraded state.
- There is also observable evidence of wetland specific plant species which had stopped blooming in the wetland due to its degraded state.
- There have also been socio-economic returns attributed to the rehabilitation of the wetland. This was identified through the regrowth of wetland plant species. Some of these plant species are commonly used to weave mats by women in Mpophomeni, which they then sell within the community. This local economy is slowly being restored back into the community, which had been lost along with the provisioning ecosystem service of the wetland. The outcomes of the wetland rehabilitation were ecologically driven; thus, the goal of the project was to restore the wetland back to its ecological health which entailed the wetland delivering the required ecosystem services

for the environment and local community. Although the quantifiable results in monetary value of the value of the ecosystem services are not explicit, the return of ecosystem services within the wetland demonstrates an improvement in water quality, which inherently means the improvement of water quality in the Midmar Dam.

2. Which role-players were involved in the respective aspects of planning, funding, and implementing EI investments?

Table 9-10 Summary of role players involved in different phases of the project

Project phase	Mpophomeni WWTW wetland rehabilitation	Mthinzima Stream Wetland rehabilitation	EnviroChamps (Wetland Monitoring)
Planning	Umgeni Water	**EDTEA (Ian Felton):** identified the opportunity for the rehabilitation of the Mthinzima Wetland and the crucial role I (wetland) can play in purifying the water flowing form the Mthinzima stream, entering Midmar Dam. **GroundTruth:** were responsible for developing the initial wetland rehabilitation plan for the Mthinzima wetland, which was then shared with the Zenzele Community group. Eastern Wetlands (Pvt) UMDM (Gov.)	WESSA (NGO) /DUCT (NPO): **Bab Cele:** was involved in the initial planning meetings leading up to the implementation of the wetland rehabilitation project. His vast experience as an EnviroChamp and understanding of the environmental challenges faced in the community was critical in informing the planning of the rehabilitation project.
Funding	UMDM (Gov.) & Umgeni Water (Gov.) (infrastructure grants)	**National NRM (Gov.):** Specifically, the *Working for Wetlands (WfW)* programme, funded the initial wetland rehabilitation plan, specifically the labour-intensive activities and the authorisation process. **Umgeni Water (Gov.):** Umgeni Water (UW) provided funding for the materials required for the engineered infrastructure of the wetland.	UMDM (Gov.) Other (through WESSA/DUCT) (NPO - Donor) **Umgeni Water (Gov.), SANBI and GroundTruth (Pvt):** *Phase 1:* Through funding from SANBI the Mpophomeni EnviroChamps were employed to conduct the first phase of wetland monitoring. Further, GroundTruth provided wetland monitoring training in 2022, through the Wetlands Key Concepts course. *Phase 2:* The EnviroChamps were funded by UW to continue monitoring of the Mthinzima wetland, which included training provided through GroundTruth.
Implementing		**GroundTruth**: was employed to implement the earthworks (engineered infrastructure) and conduct the training. Eastern Wetlands	WESSA/DUCT (NPO) GroundTruth (Pvt)

3. How relevant are the returns described earlier to key role-players, in particular for private sector role-players?

The returns mentioned earlier, although important are more valuable to private sector when quantified into monetary value. For example, the improved water quality of the Mthinzima stream, due to the water purification function of the wetland being restored, replaces the high treatment costs that would otherwise be required to purify the water. A replacement cost can be established from the water quality data, which would be more effective in attracting private sector funding. Furthermore, Midmar Dam is a major tourist attraction which includes the Midmar Mile swimming event – the world's largest open water swim. This event contributes to the local economy through the hospitality sector and thus provides financial returns for private sector role players within the uMngeni catchment.

Additionally, one of the main objectives of the wetland rehabilitation project for key role-players such as UW (government), GroundTruth (private) and the Mpophomeni community was the restoration of the ecosystem services of the wetland through the project, specifically the provisioning (restoration of local economy) and regulating services (water purification). The wetland is suitably located to purify the water, thus improving water quality before it enters Midmar Dam. Thus, reducing the purification costs that would otherwise be done by wastewater treatment works.

4. Which funding mechanisms were applied and how did these develop? What criteria, if any, did the initiative need to meet in order to secure the funding.

[See also overview section on the origins of the initiative]

For the EnviroChamps and Mthinzima Stream Wetland rehabilitation (downstream of the R613 road and new WWTW, communal land) components, funding was pursued and secured primarily through written proposals to government administered programmes funded through public and donor funds.

Funding sources for project:

The initial funding for the project was sourced through the WfW programme, of as the main objective of the WfW programme is employment creation and conservation of wetlands. To secure and meet the funding requirements of WfW, the rehabilitation plan was redesigned to include a labour-intensive approach. However, the earthworks required by the rehabilitation plan was not covered by WfW funding due budget constraints, thus UW provided funding for materials required for engineered structures.

For the rehabilitation of wetland areas associated with the new WWTW (upstream of the R613 road), funding was secured through regulation: wetland rehabilitation was a condition of the environmental authorisation for construction of the WWTW. Funds were provided as part of the overall funding of the WWTW development - public funds through the District Municipality (infrastructure grants).

Mpophomeni WWTW wetland rehabilitation (upstream of the R613 road)

Rehabilitation of wetlands associated with the planned Mpophomeni WWTW and associated reticulation pipeline.

- Public (state) funds through the District Municipality (infrastructure grants)
- Managed/Administered by Umgeni Water **Mthinzima Stream Wetland rehabilitation (downstream of the R613 road and new WWTW)**

Rehabilitation of a wetland located downstream of the WWTW (and the R613 road) on communal land (owned by a Tribal Trust). The rehabilitation was estimated to cost approximately R5 million, including hard infrastructure (concrete weirs) and (initially) the use of machinery.

Approached/Proposals:

- Regional Working-for-Wetlands, not successful - out of the project cycle, concerns over land-owner consent.
- GEF 5 (SANBI) Challenge Fund – proposal (2015/2016 with Project Business Plan) was not successful.
    - *The Challenge Fund was created specifically as a means of 'using' the GEF 5 BLU funds. The GEF 5 funds were not secured specifically for the Mthinzima-Mpophomeni EI investment, but for the broader BLU project, which later 'selected' the Mthinzima-Mpophomeni system as one of the UEIP demonstration sites.*
- UMDM, specifically for assistance in seeking Landowner consent. UMDM supported the co-ordination and land-owner meeting.
- Specialists/consultants - in-kind contributions were solicited (and obtained) for soil and agricultural surveys.
- National (Government) NRM 3-year project cycle – proposal (with Eastern Wetlands as the implementer) was successful (2016), **with conditions**:
    - Would **not fund hard** infrastructure or machinery,
    - R3.7 million (of the R5 million proposal) was awarded for labour (from the local community), PPE, training and co-ordination over a 3-year period.
    - *Without the hard infrastructure (concrete weirs) the benefit of the rehabilitation would be much reduced.*
    - *The proposal was based on a collaboration including the local uMngeni Municipality, the District Municipality and Eastern Wetlands as the implementer (who were already an 'approved implementer' for the National NRM programme).*

The SANBI Challenge Fund then reconsidered and agreed to contribute (not fully fund), **with conditions:**

- Would contribute R1.1 million towards soft infrastructure and labour,
- Funds would need to be administered through the Government NRM programme.
- *There would have been a challenge in transferring GEF funds from SANBI to the Municipality. Directing the funds through the National Department and the NRM programme (the DFFE-NRM-SANBI link) made it easier to secure funds from the Challenge Fund for the Municipality (UMDM) led initiative.*
- By this time, the new Mpophomeni WWTW development, administered by Umgeni Water, was approved. The UMDM co-ordinator approached Umgeni Water regarding the possibility

of Umgeni Water providing (donating) the materials required for the hard infrastructure components of the rehabilitation for the wetland portion not included with the WWTW development. This was successful and Umgeni Water agreed to pay a local supplier to provide the necessary materials.
    - The cost of the materials had to be estimated and approved by Umgeni Water prior to materials being sourced from the supplier.
    - *Umgeni Water, at around this time, was increasingly recognizing the link between catchment condition/management and water quality, which contributed to their willingness to support the wetland rehabilitation intervention.*
- Two proposals to a Government Environmental Implementation Programme, one for funding the EnviroChamps component and one for funding the rehabilitation of the wetland downstream of the pla2nned WWTW (and R613 road). Neither were successful.
- Private sector funding was not specifically pursued for the wetland rehabilitation. The public and donor sector funds (R5.3 million secured) were adequate for the planned rehabilitation.

In order to secure funds through the NRM programme, the rehabilitation plan had to be adapted to the NRM implementation model of maximising labour intensity (work opportunities created) and training and capacity building had to be incorporated.

A benefit of implementing through the NRM programme was **avoiding the need for an Environmental Impact Assessment (EIA) and water use licence application, which would have added significant costs**. The NRM Working-for-Wetlands programme had already secured an Environmental Authorization and Water Use Licence covering a group of wetlands in the catchment including the Mthinzima wetland.

Table 9-11 Summary of funding sources for the Mthinzima Stream rehabilitation and water quality improvement initiative over its 2011 - 2024 period thus far

Aspect/Activity	Funding Source	Time period	Value/Amount (Rands)	Value/Amount (% total)
Mpophomeni WWTW wetland rehabilitation				
All components	Public funds (government infrastructure grants through UMDM and Umgeni Water)	[TBC through further stakeholder engagements and document review.]	[TBC through further stakeholder engagements and document review.]	[TBC through further stakeholder engagements and document review.]
Mthinzima Stream Wetland rehabilitation				
Labour, PPE, training, co-ordination	Public funds (government NRM programme)	3-year period	3.7 million	74 % of estimated cost
Labour, soft rehabilitation interventions	Donor funds (GEF, administered by SANBI, directed through the NRM programme)	3-year period (through/with the NRM funds)	1.1 million	22% of estimated cost
Hard infrastructure materials	Public funds (Gov. Umgeni Water)	[TBC]	500 000	10% of estimated cost

Aspect/Activity	Funding Source	Time period	Value/Amount (Rands)	Value/Amount (% total)
TOTAL			5.3 million	106% of estimated cost
EnviroChamps				
Airtime stipends	Public funds (District Gov, UMDM) Donor funds (NPO DUCT through PES (Presidential Employment Stimulus)/WESSA) SANBI	2-year period through DSI funding and co-funding	This information is currently unavailable and will be informed by the second phase of the stakeholder engagement process.	
Co-ordination/management	Phase 1 of monitoring: DUCT Phase 2 of monitoring: SANBI	Phase 2: October 2021 to November 2022	This information is currently unavailable and will be informed by the second phase of the stakeholder engagement process.	
In-kind / pro-bono contributions				
Overall co-ordination	UMDM (Gov.)		This information is currently unavailable and will be informed by the second phase of the stakeholder engagement process.	
Planning (Development of wetland rehabilitation plan)	GroundTruth (Pvt)	2014-2015	Pro Bono	Pro Bono
Land Capability Study (soil and agricultural surveys)	KZN Department of Agriculture and Rural Development (DARD) (Provincial Gov.)	2015	This information is currently unavailable and will be informed by the second phase of the stakeholder engagement process.	
EnviroChamps co-ordination	DUCT/WESSA	3-year period	This information is currently unavailable and will be informed by the second phase of the stakeholder engagement process.	

5. <u>What is the business case for private sector investment in water-related EI within the initiative and how was this developed and communicated amongst the role-players?</u>

Ultimately, the wetland rehabilitation and EnviroChamps initiatives to improve the water quality of the Mthinzima Stream would contribute towards the protection of the strategically important Midmar Dam water resource. Thereby maintaining the tourism sector associated with the Dam such the Midmar mile, regarded as of the biggest open water swimming competitions in the world. Through the rehabilitation of the Midmar Dam, key role players seek to reduce the likelihood of higher operational management and potable water treatment costs in future. While certainly a case for private sector benefit and therefor investment, private sector funding was not specifically pursued in this case/thus far and there is an acknowledgement of the need to develop an evidence base demonstrating the benefit and particularly relevant to consider in scaling out to other catchments within the greater uMngeni / Midmar system.

Mthinzima Stream Wetland rehabilitation

- Private sector funding was not specifically pursued for the wetland rehabilitation.
- A meeting was held with the landowners (local community) where various assessments were presented and the results/implications discussed, including: a Land Capability Study (soil and agricultural surveys), which indicated limited potential for crop production and agricultural suitability as extensive (low intensity) grazing (which was the existing land use); and the rehabilitation plan.
    - No suggestions/plans for fencing off any areas were part of the wetland rehabilitation plan/proposal.
    - Additional rock-packing was incorporated into the rehabilitation strategy to provide additional protection from cattle trampling.

EnviroChamps

Private sector funding was elicited through the AEN programme through the blended finance approach applied within the programme. Additionally, the programme was funded through the Department of Science and Innovation (DSI) and supported through co-funding, which each partner had to raise. This included pursuing funding from a range of stakeholders such as small businesses, of which the buy-in factor was the minimum funding requirement per team of 10 Enviro Champs which was R50 000. This amount was relatively small when compared to the large impact funders could make, thus attracting private funding.

6. <u>To what extent has the EI investment contributed to social justice?</u>

EnviroChamps

- Recognized training: Through the wetland monitoring component of the project, the EnviroChamps have been able to be involved in a range of trainings such as the Wetland key concepts course which can contribute to building their qualifications.
- Building skills beyond citizen science monitoring (basic plumbing)
- Job creation for the EnviroChamps

Mthinzima Stream Wetland rehabilitation

- Temporary work opportunities for local community members during the implementation of the rehabilitation activities.
- Initial proposals included aspects to create an income opportunity for the landowners (Trust) related to birding tourism – these were not successful.
- Project co-ordinator feels that a community benefit link is still missing, however more recent growth and development in the EnviroChamps component is going some way to increase community benefits. Suggestions include:
    - Community access to Midmar Dam (for recreation)
    - Improved grazing (better practices) and employing eco-rangers (cattle on the main road are a concern), however there are political/land-ownership issues related to cattle grazing in the area.

7. What key lessons were learnt from the initiatives and, taking these lessons into account, how scalable is the case?

Enablers:

- Establishment of the UEIP and the associated collaborations and objective to identify and support three demonstration sites.
- Existing environmental authorization and Water use Licence (WULA) for the downstream wetland rehabilitation through the National NRM programme, which would otherwise have added significant costs to the initiative.
- Securing the NRM funds facilitated access to the SANBI Challenge Fund.
- Rehabilitation of the upstream wetland being a condition of the environmental authorization for the WWTW, which contributed to motivating Umgeni Water's support of the downstream wetland rehabilitation. The rehabilitation plans for the various wetlands were integrated and complimentary.
- Landowner consent – the NRM Working-for-Wetlands programme had not prioritized the wetland for rehabilitation due to concerns over obtaining land-owner consent from a Tribal/Communal land Trust. The UMDM co-ordinator made sure to engage the land-owners and community directly and to obtain various assessments and information and present these to the land-owners for consideration.
    - Existing relationships between the UMDM (District Municipality) and the landowners further facilitated the engagements.
    - Community support was also forthcoming/encourage through the existing NGO initiatives around water quality and environmental education.
- In-kind/pro-bono contributions played an important role.
    - During conceptualisation and initiation, in-kind/pro-bono support in co-ordination, surveys and planning were key in building momentum and support for the initiative.
    - During implementation and maintenance

Challenges

- Securing long-term funding for the hard infrastructure.
- The original proposal drafted by GroundTruth which focused on technical components of wetland rehabilitation, was adapted by funders at different phases to fit their specific funding criteria. This resulted in some components of the rehabilitation plan not being implemented as per the rehabilitation plan. For example, the WfW funding, adapted the rehabilitation plan to include a labour-based approach, as the criteria of the funding at the time had to have an employment creation component (socio-economic benefit).
- The continuity (and dedication) of the people involved is an influential factor in initiating, planning, funding, and scaling the initiative. This was a challenge in the Mthinzima case, those components of the rehabilitation strategy where the same people remained involved were 'more successful'.

Key lessons:

Develop a business case demonstrating the socio-economic outcomes of the EI intervention:

- Data collected by the EnviroChamps within the wetland monitoring programme can be used to build a business case to attract more funding for other components of the rehabilitation

plan which have not been implemented. Specifically, water quality data (showing the improvement of water quality due to the functioning of the wetland) can be translated into monetary value which is valuable to the private sector.

Pursue and plan for multiple sources of funds over different timeframes.

- Desired funds may not all be secured prior to starting implementation, consider taking an incremental and/or component approach.
- Funds for different aspects of the intervention (e.g. hard/soft infrastructure, monitoring, capacity building, co-ordination) may need to be sought from different funders.

Allow for flexibility in the intervention design/plan and implementation.

- Be prepared to adapt the approach to accommodate the funder's requirements.

Look for opportunities to make and/or highlight links between grey infrastructure and ecological infrastructure.

- Reducing the risk to the water quality of the Midmar Dam (major regional water supply dam) was a driving motivational factor across the components of the initiative, which was communicated explicitly in the various proposals.
- The rehabilitation plan for the downstream wetland was integrated with, and complimentary to, the overall design and wetland rehabilitation of the new WWTW.

uMhlangane Initiative

The uMhlangane initiative is in a highly urbanised and densely populated area in the eThekwini Municipality of KwaZulu-Natal and is characterised by a diverse land-use context e.g. commercial, residential, industrial, and ownership i.e. state, municipal, and private land ownership. Water risk factors within this case study include flood risk reduction and water (quality) security in the highly urbanized catchment area. Therefore, some of the key ecosystem service(s) include being flow regulation/flood attenuation, water quality enhancement, and biodiversity conservation through habitat protection and enhancement. Initially, the investment EI in the uMhlangane catchment was undertaken in the River Horse Valley wetland, located in the River Horse Valley Business Estate. This portion of the uMhlangane River floodplain was identified as a potential pilot project for the Durban Green Corridor initiative, to serve as a catalyst for the improved management of freshwater ecosystems within the region and contributing towards a sustainable development approach.

A joint Bremen city and Durban cities project funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) was launched in 2013 focussing on protecting and restoring ecosystems in the uMhlangane river catchment in northern Durban – otherwise known as the Riverhorse Valley Wetland. The measures were designed and aimed at mitigating the negative impacts of climate change, such as flooding and water pollution. The project also aimed to make a direct contribution towards improving the living conditions of the local community. The management of the wetland area is still ongoing post the initial above-mentioned project, through various Riverhorse Valley Business Estate Management Association initiatives. This River Horse Valley system is an example of cooperative rehabilitation and management of a freshwater ecosystem within an urbanised landscape involving the investment by the public and private sector, civil society organisations/businesses.

At a broader catchment scale, the eThekwini engineering department recognised that most local watercourses in the eThekwini Municipality were severely degraded/impacted, and that there was a lack of coordination between various municipal departments in resolving these issues. Most watercourses were clogged with invasive alien plants and heavily polluted with litter/waste. These impacts have led to stormwater blockages and pollution downstream of highly populated areas posing as a health and safety hazards for its inhabitants. In 2009, the eThekwini Roads and Stormwater Maintenance Department (RSWM) together with various line departments within the city developed an operations manual for an integrated sustainable programme to focus on the worst affected streams in high density areas of the city. The programme aim was to ensure that all watercourses were brought up to an appropriate standard to reduce stormwater blockages and pollution downstream of these high-density areas. This programme was then aligned to address the eThekwini Municipalities objective of creating work opportunities, experience and skills for local contractors and communities within the wards of the streams being targeted. Due to budget constraints the initial focus areas were in the Inanda, Ntuzuma and Kwamashu (incorporating the catchment in which the River Horse Valley wetland is located) and Umlazi areas. There are approximately 800km of rivers, streams, and open storm water channels within the afore-mentioned target areas. Various departments, ward councillors and ward committees within the municipality were consulted and assisted in identifying the worst affected watercourses according to their condition and the impact these had on the surrounding communities within the identified areas. This resulted in 100km of the stream network being selected in the Umlazi area, and 300km in the Inanda, Ntuzuma and Kwa-Mashu (INK area). Each co-operative (co-op) that is formed, operated, and sustained by local community members and organisations was allocated 5km of stream that they had to clean/clear and maintain. An expression of interest was advertised, where cooperatives were asked to respond by submitting their company documents to the eThekwini Municipality. Qualifying co-ops that responded and who resided within the project areas were selected to be part of the programme to assist in goal of maximizing employment opportunities for community members that reside within the local area. Each co-op had between 5 and 8 members. Co-operatives were contracted for a 36-month period to perform tasks (**Table 9-12**) and paid at a pre-determined rate on tasks completed for the month.

Table 9-12 Scope of work for each co-op under Ethekwini Municipality-funded programme

Scope of Contract	
Natural streams – debris	Remove all rubble and refuse blocking the free flow of the stream and disposed of it at a designated municipal disposal site. The stream is to be kept clear of all debris for the duration of the contract.
Natural streams – alien vegetation removal	Invasive and alien vegetation to be removed and disposed of at a designated municipal disposal site. The project area is to be kept clear of all alien invasive vegetation for the duration of the contract
Natural streams - erosion protection	Stream bed and stream banks to be protected against erosion by constructing and maintaining erosion bolsters as per the municipality's standards. Minor scour areas must be backfilled with rock and compacted. Rocks can be collected from the surrounding area or to be supplied by the Roads and Stormwater Maintenance Unit.
Grass and vegetation maintenance	All grass and vegetation must be cut and kept to a maximum height of 150mm. Width from either side of stream edge will be defined but should not be less than 3m. Cuttings must be disposed of at a designated municipal disposal site.
Litter control	Emptying of bins and picking up of litter, refuse and debris found in the stream and to be disposed of at a designated municipal refuse disposal site. The project area is to be kept clear of all litter for the duration of the contract.

The programme has largely been successful and is still funded annually by eThekwini Municipality. By 2019 it had succeeded in improving the ecological environment of targeted streams as well as creating approximately 640 work opportunities at a local level, with 80 cooperatives maintaining 400km of streams. The programme has evolved and is incorporated into eThekwini's Transformative River Management Programme (TRMP) and has expanded to catchments across the municipality.

Over the past 30 years, deteriorating river water quality and more frequent flooding have caused escalating costs to the city, businesses, and citizens of Durban (C40 Cities Finance Facility (2022a). As a response, eThekwini Municipality has built a strong policy base and institutional buy-in for riverine management, especially in partnership with other stakeholders, resulting in the establishment for the eThekwini Transformative River Management Programme (TRMP) (**Table 9-13**).

Three contrasting TRMP projects that learnings for this initiative can be drawn from and compared include:

- Sihlanzimvelo Project
- Green Corridors Green Spaces project
- Aller River Pilot Project

Table 9-13 Contrasting eThekwini Riverine Management Projects (C40 Cities Finance Facility, 2019:5)

	Sihlanzimvelo Project	Green Corridors Green Spaces project	Aller River Pilot Project
Project lead agent and partners	Led by the city department responsible for roads and stormwater maintenance 11 other city departments participate in a project steering committee	Led by the Green Corridors NPC, a city-supported special purpose vehicle working on community upliftment through the creation of a green spatial economy. Green Corridors facilitated partnerships between municipality and other river management stakeholders	Led by the Kloof Conservancy, a community-based organisation promoting environmental awareness and protection Partnerships with nonprofit organisations for implementing different aspects of the project Several city departments contributed to project activities
Objectives	Removal of litter/waste and invasive plant species from stream areas to reduce stormwater blockages and create employment	Enhance local quality of life, living environments and sustainable livelihoods	Restoration of sections of the Aller River with a focus on water quality improvement and invasive species removal
Funding	eThekwini Municipality Roads and Stormwater Maintenance departmental operating budget, embedded programme management staff	3-year funding agreement with eThekwini Municipality, plus other externally funded projects	eThekwini Municipality Environmental Planning and Climate Protection Department, later phases funded by donor agencies
Community partnership approach	Community co-operatives employed to clean 300km of stream banks and culverts from waste and invasive species. The streams are located in high-density, low-income settlements where poor river quality is associated with human health risks and flooding impacts A consultant	Local communities employed to maintain, improve and create new riverine open spaces Sustainable livelihoods supported through upcycling / recycling waste from rivers and growing food near restored streams Community-based ecotourism and nature-based youth development	Local communities employed to remove invasive alien plants and clean litter from streams Community Eco-Champs' employed to build awareness and capacity for community river stewardship, monitor rivers and report pollution issues

	Sihlanzimvelo Project	Green Corridors Green Spaces project	Aller River Pilot Project
	is employed to manage the project, including appointing community assessors to monitor implementation and build local awareness		
Timelines	Initiated in 2012, ongoing	Initiated in 2010, ongoing subject to annual renewal of the Memorandum of Agreement with eThekwini Municipality	June 2016, ongoing

TRMP comprises a wide range of stakeholders, including private business e.g. Bridge City Management Association, NGOs e.g. Green Corridors, DUCT, Adopt-a-River; civil society organisations e.g. Safe cities, local authorities e.g. eThekwini municipalities Coastal Stormwater and Catchment management, and local communities e.g. Clean My Community Forum, INK Enviro Org. These stakeholder groups, in addition to funders and investments corporations/DFIs (AFD, GIZ, State Secretariat for Economic Affairs Economic Cooperation and Development (SECO), World Bank, International Finance Corporation, DBSA and Dutch IFI Investment International) make up the critical role players.

Insights gained from a review of information (obtained from interviews with key stakeholders and literature) on the eight guiding questions is summarised below:

1. What are the quantifiable ecosystem service returns (outputs and outcomes) from EI interventions associated with the implemented initiatives, especially those services related closely to water security?

Outputs:

River Horse Valley wetland management

- Improved physical conditions and aesthetics of the wetland system.
- Employment of community members to remove alien plants, and plant indigenous plants within the wetland.
    - Planting over 100 *Calpunia aurea, Syzigium cordatum* and *Bridelia micranta* trees on periphery of the wetland.
    - 41.5 hectares of alien plant species and refuse were removed from parts of the wetland habitat.
- Employment of community members to remove alien vegetation from tributaries associated with the wetland.
    - Removal of invasive alien plants in 54 hectares of riverine area upstream of the wetland.

Transformative Riverine Management Programme

- Transformation of more than 7 000 kilometres of the City's rivers and streams over a period of 10 years through the clearing of alien invasive plants, planting of indigenous tree species, and the reinforcement of natural infrastructure (stream/riverbanks).
- Predicted to provide at least 10 000 permanent jobs.

Outcomes:

River Horse Valley wetland management

- Improved efficiency of the ecological functioning of the wetland and associated freshwater ecosystems, thereby reducing the risk of flooding through improved flood attenuation.
- Decreased erosion in the wetland area and improved wetland services.
- Local community empowerment and increased income and wellbeing of community members through employment opportunities.
- Sustainable ecosystem management practices (such as alien invasive plant clearing and replanting of indigenous riparian tree species).
- Establishment of a continuous water-quality and flow monitoring station downstream of the rehabilitated wetland.

Transformative Riverine Management Programme

- Biophysical riverine management.
- Improved functionality and resilience of rivers to urban impacts and climate change.
- Improvement of the condition and/or management of the built landscape surrounding rivers due to the minimisation of accelerated stormwater, sediment, and pollution loads.
- Decreased climate change vulnerability and impacts of flooding on communities, households, natural- and built infrastructure, and economic development of the city.
- Community upliftment and empowerment through employment opportunities.
- The program resulted in improved water quality due to sewer leaks being reported and fixed timeously. However, this has not been quantified.
- The benefit of the program with regards to protection of municipal road crossings and public benefit have been quantified through the cost-benefit analysis.

The outputs and outcomes listed above reflect the extensive investment in EI in the uMhlangane catchment that has contributed to the improvement of the ecosystem services and functioning along the uMhlangane River, the health and well-being of local communities and strengthened the resilience of the natural infrastructure in this catchment.

2. Which role-players were involved in the respective aspects of planning, funding, and implementing EI investments?

Table 9-14 Role players involved at different phases of the EI investment in the uMhlangane catchment

Initiative	Planning	Funding	Implementation
River Horse Valley wetland management	Bremen city (Germany) and eThekwini Municipality Environmental Planning Climate Protection Department (South Africa)	German Federal Ministry for Economic Cooperation and Development (BMZ) (donor)	Bremen city and eThekwini Municipality - Coastal Stormwater and Catchment Management Department and eThekwini Economic Development Unit (government) Green Corridors Non-Profit Company (NPC) Riverhorse Valley Business Management Association (business)

Initiative	Planning	Funding	Implementation
Transformative Riverine Management Programme	The C40 Cities Finance Facility (CFF) (donor) French Development Agency (AFD) Cities and Climate in Africa (CICLIA) eThekwini Municipality (government)	CFF German Federal Ministry for Economic Cooperation and Development (BMZ) Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH French Development Agency (AFD) (donor) eThekwini Municipality Bridge City Management Association (private)	eThekwini Municipality - Environmental Planning & Climate Protection Department & Coastal Stormwater and Catchment Management Department (government) GroundTruth (private) A range of NGOs and civil society organisations including for example Green Corridors, Ntuzuma Conservancy, DUCT, Adopt-a-River.

3. How relevant are the returns described earlier to key role-players, in particular for private sector role-players?

River Horse Valley wetland management

The uMhlangane wetland rehabilitation project demonstrated the value of restoring ecological infrastructure as part of the municipal stormwater system, particularly in the context of escalating climate change related flooding. Such ecological infrastructure restoration often requires both capital and operational funding, which can be difficult to raise within the boundaries of municipal financial policy given ecological infrastructure is not usually reflected in the municipal asset register. The project highlighted this structural problem and sought to demonstrate the case for functional ecosystems to be recognised in municipal accounting systems as critical infrastructure in need of adequate capital funding and ongoing maintenance, in the same way as engineered infrastructure. This also pointed to a need to unlock current problems associated with raising capital for major ecological infrastructure projects by way of loans. The project also highlighted that when there is shared value in ecological infrastructure between the municipality and private sector actors, co-investment can be leveraged. This was an ecosystem-based adaptation that involves wetland restoration and river management. The project has led to the reduction of flood risk and improving river water quality. Wetland restoration and long-term management was implemented in partnership with other organisations and the management agency to ensure that a continuous water quality monitoring station was installed to measure long-term impacts of the intervention on water quality downstream. This action has contributed to the long-term sustainability of the efforts and project activities. The Bridge City Management Association represents several of the key private sector stakeholders in the proximity of the wetlands, and who are affected by flooding and the functioning of the wetland. The long-term active participation of the Bridge City Management Association is testament to the private sector recognition of the benefits and returns from their investment. The ongoing commitment and investment by eThekwini Municipality, and the expansion of the TRMP is evident if recognition of the meaningful returns on investment to the public sector. Similarly, the recognition of the socio-economic returns is evidenced by the growing commitment by NGOs, civil society organisations and community groups.

Transformative Riverine Management Programme

eThekwini Municipality's plan to provide sustainable water services and protection from flooding included within the city's climate action plan, promotes nature-based solutions and the protection of the city's green ecological infrastructure. The Transformative Riverine Management Programme (TRMP), which restores and protects the city's rivers, is a key part of its delivery. Projects have a strong focus on community involvement, capacity/skills development, and the creation of economic opportunities for low-income populations (C40 Cities Finance Facility, 2019; City of Durban, 2022).

These projects have also become a mechanism for addressing climate change risks. The scale and urgency of the need for action on climate change has resulted in a global focus on 'transformation', implying large-scale, sustained, and catalytic carbon emissions reductions and enhanced resilience within cities. eThekwini municipality has built a strong policy base and institutional buy-in for riverine management, especially in partnership with other stakeholders. Since 2010, it has implemented several riverine management projects. Although slightly different in focus and structure, they contribute collectively to the city's experience and track record in managing river systems for locally important socio-economic, financial, and ecological benefits. These projects support cost-efficient delivery of city services (C40 Cities Finance Facility, 2019).

The importance of the TRMP and the rationale for upscaling was further evidenced by the extensive damage and devastation caused by the April 2022 flood events within eThekwini. Extensive damage was experienced to infrastructure at river crossings and to services adjacent to the rivers. Analysis has shown that alien vegetation and solid waste were the main causes of blockages, which exacerbated the ensuing damages. The damage resulted in monetary losses for both public and private stakeholders, as well as in substantial social costs to society and in particular to poorer communities. Notably, there were far fewer blockages and less damage to the streams being managed under the Sihlanzimvelo initiative, which evidences the benefits of a riverine management programme (Tooley, 2022). Recognition of these benefits returns by private, public, and civil society stakeholders is demonstrated by the growing support by all sectors for the expansion of the TRMP.

4. Which funding mechanisms were applied and how did these develop? What criteria, if any, did the initiative need to meet in order to secure the funding.

Funding mechanisms

- A motivation for the funding from an internal/municipal budget is needed and if successful this funding is then allocated as a standing line item in the annual budget – once allocated it cannot be taken away (with condition that it must be spent every year). If it is spent and targets are met, then it is unlikely line that the item will ever be removed – e.g. eThekwini's Sihlanzimvelo programme has been going for more than 10 years.
- Some funding comes in the form of grants (e.g. Germany's BMZ funding) with no specific conditions, other than reporting requirements.
- DBSA funding is typically linked to particular conditions.
- National Treasury has funding in the form of green bonds (driven from renewable energy and climate change).
- Municipality imposes full tender processes and performance management conditions as well as payment structures of Municipality when it is funding a third party for EI. Normally, these are funded through rates based Opex budgets of the different departments. The approach is

determined by an individual within the department that realises that it is cheaper to go the EI investment route rather than implementing traditional engineering methods.

Criteria

- Track record of due diligence / financial management is key - due to issues relating to accusations of financial mismanagement being linked to the Municipality, there is evidence that the disposition of financiers/donors is changing – this is resulting in a lot less funding is coming directly to government and often rather via a third party. This has translated into less funding or straight forward grants being awarded due to concerns around how money is allocated and awarded.
- Ring fencing of funds – for example, DBSA requires a level of ring fencing, but this can be quite difficult in a municipality as it is not possible to set up separate bank account. However, it is possible to set up a "vote" wherein which spending can be tracked and allocated. In the private sector, recipients and required to open a separate bank account for all funds received and all transactions processed for the project.
- Audit requirements - Most funders require audits (e.g. BMZ require internal and third-party audits) before additional funding tranches are released. Sometimes funders will require an upfront check on whether the municipality has a clean audit in the application process.
- The funding applicant's track record –eThekwini Municipality been quite strong in the fields of ecological infrastructure/water and climate change. This is one of the reasons that the TRMP has received so much support, i.e. because Sihlanzimvelo Programme has been running effectively for more than 10 years and is a proven line-item budget.
- Demonstrate funding from other sources - co-funding is often a criterion as it helps to demonstrate the applicant's effectiveness and track record in the field.
- Demonstrate impact and a clear link to funders vision/goals – Being capable of packaging / presenting the concept to funders is critical. Even if it is a sound concept it may not receive funding support unless the applicant is able to demonstrate how it addresses the funders' global vision / goal. GIZ for example provides support to applicants to help proposal development and concept development and how it links to agenda of the funders and global objectives.

5. <u>How was the funding structured (organized, designed or set-up) i.e. What type of funding e.g. donations, loans, and repayments etc.</u>

- For the TRMP, the funding was provided by the Deputy Head of Roads and Stormwater Maintenance out of the municipality's Opex funding on the basis that this intervention would reduce the maintenance costs of cleaning and repairing the road crossings. The initial funding was for a 295km stretch of river courses. A benefit cost analysis was done using this work as a basis and the positive figures from this benefit cost analysis resulted in further funding being allocated by the Chief Financial Officer (CFO).
- Significant donor funding has been secured through unconditional grants, with tranches largely being released on the submission of reports.
- Funding from the private sector has largely been in the form of grants, but with conditions such as achievement of milestones and measurable targets before the release of the next tranche. Output indicators such as hectares rehabilitated, and jobs created are typically accepted in recognition that the longer-term outcomes (such as improved wetland functioning and social justice) are not possible to measure during funding cycles of 3 – 5 years.

6. What is the business case for private sector investment in water-related EI within the initiative and how was this developed and communicated amongst the role-players?

Transformative Riverine Management Programme

The TRMP business case argues that there is "potential to create 9 181 jobs through over 1 000 community co-operatives in a city-wide TRMP. In addition, enterprise development in the green economy is possible through the productive use of organic biomass and litter collected from rivers (as well as solid waste collection in informal settlements to prevent it washing into rivers)" (Mander et al., 2021: 13). According to the eThekwini Profile Analysis, District Development Model (Department of Cooperative Governance and Traditional Affairs, 2020), 18.7% of eThekwini's population was unemployed in 2020, which is approximately 745 690 people. While there is strong evidence that Sihlanzimvelo-like activities contribute to employment for some of the most vulnerable communities in eThekwini, more evidence is needed to understand the full range of societal benefits from the TRMP, particularly in terms of sustainable livelihoods and lifting people out of poverty. This aspect has been understudied relative to other benefits that have been explored while developing the TRMP.

Models illustrate how every R1.00 in municipal TRMP investment, R0.30 in damage to municipal road culverts could be avoided. Furthermore, the societal co-benefits from this investment are notable, with a significant number of vulnerable riverine communities being protected from losses linked to damaged infrastructure and increasing exposure to risks associated with declining river conditions. Each R1.00 municipal spend benefits these groups by R0.80, more than double the benefit created from management of private or Traditional Authority riverine areas. Coastal users stand to benefit by a further R2.50 without the municipality incurring additional costs. Find appropriate cost sharing mechanisms that allow these groups to contribute towards securing the coastal benefits from riverine management would be wise. This could, for example, be achieved through a special coastal hotel bed levy, or through coastal Special Rating Areas that contribute funding towards transformative riverine management. Overall, each R1.00 spent by the municipality on transformative riverine management on its own land could generate up to R5.23 in municipal and societal benefits (Mander et al., 2021: 72).

Studies show that many of Durban's rivers are already severely impacted by urban and agricultural development, and pollution. It is estimated that the ecosystem services supplied by these urban rivers are 42% below the theoretical best case and that climate change will degrade these systems further, reducing ecosystem services supply by a further 11% by 2040. eThekwini will be directly affected, with annual damages to municipal road culverts alone due to increased climate-change-related flooding estimated at over R151 million by 2040. Declining river water quality will affect coastal tourism and property values, as well as the ability of riverine communities to access and use rivers for household water provision, crop irrigation and recreation (Tooley, 2022).

The annual cost implications for the wellbeing of municipal citizens and coastal users are estimated to reach R224 million by 2040. (Only historic damage costs to culverts were available to use in this study and so it is recognised that costs indicated are lower than what will be experienced once all infrastructure damage is totalled.)

The Cost Benefit Analysis (CBA) shows that if the city upscaled the existing Sihlanzimvelo programme on municipal land – approximately 1 168 km of river – this would cost the city approximately R92 million annually. The city would experience avoided damage costs to municipal culverts and road crossings of R59 million (this excludes damage to sewers, watermains and other municipal

infrastructure). The societal benefits each year are estimated to be R177 million; 234 coops would be needed to do the work, which would create some 1 557 jobs. This translates to R2.60 in benefits for every R1 spent by the city. The additional green economy opportunities in terms of job creation and economic benefits have not been included. In turn, for a city-wide TRMP, the CBA shows that an investment of R7.5 billion by the public and private sector is required over the next 20 years. This would result in an avoided cost of R1.9 billion in damage to municipal culverts and roads (this excludes damage to sewers, watermains and other municipal infrastructure), R12 billion to R24 billion in societal benefits, greater than 9 000 jobs and many additional green economy opportunities. This translates to R1.80 to R3.40 in benefits for every R1 spent (Tooley, 2022).

7. To what extent has the EI investment contributed to social justice?

River Horse Valley wetland management

- The management of EI has provided security and resilience against flood risks and heavy rains i.e. in ensuring that the wetland functions properly and as it should, residents and infrastructure are protected from flood risks.
- Community responsibility, accountability, and development has been established. In having the community managing and rehabilitating the wetland, the community has developed a system of accountability and responsibility amongst themselves to ensure that the wetland works as it should and protects against flood risks.
- The management, restoration and protection of the wetland has embedded sense of agency in community members by addressing challenges linked to security and resilience to flood risks.

Transformative Riverine Management Programme

- The TRMP has provided a platform for:
    - Community empowerment and awareness on climate change.
    - Knowledge exchange on alien invasive species, natural infrastructure and ecosystem services and functions.
    - The creation of temporary and permanent employment opportunities and subsequently the upliftment of livelihoods and wellbeing.
    - Ensuring security and building resilience against flood risks and heavy rains.
    - Social cohesion and encouragement for communities to work collectively towards a common cause.

8. What key lessons were learnt from the initiatives and, taking these lessons into account, how scalable is the case?

- The TRMP / Sihlanzimvelo has remained on eThekwini Municipality's budget for more than 10 years because it has been able to demonstrate positive impacts, including avoided cost to municipality that is a high priority for public institutions. Public funding has helped the Municipality to leverage other funding to expand the programme.
    - This demonstrates opportunities created through awarding seed funding that enable implementers to demonstrate that they are able to deliver on their concept, which can then unlock further funding opportunities.
    - eThekwini Municipality should not choose between the option of upscaling Sihlanzimvelo or implementing a transformative riverine management approach.

Rather, a blended process is recommended, involving upscaling of Sihlanzimvelo as a known, tested implementation model, with incremental introduction of transformative management in priority locations where the additional investment will yield greatest benefits (Mander et al., 2021).

- The nature of EI rehabilitation means that it is very difficult to demonstrate quantifiable change during funding term/grant e.g. 1 year or 3 years. Funders requiring the achievement of quantifiable indicators to secure investment need to recognise these challenges and to consider alternatives such as output indicators, linked to theory of change, in the form of shorter-term indicators (e.g. ha of IAP cleared as an output that will contribute to the outcome of improved wetland functioning).
- The importance of developing an effective funding relationship must be recognised i.e. it is important to be transparent, clear, and honest upfront of what can and can't be done within the stipulated timeframe. This helps to establish a funder and funding recipient relationship and to be upfront about funding expenditure and hinderances e.g. startup lags and spreading funding spend. The programme implementers need to be capacitated to understand the language and requirements of the donors when starting the applications. The project staff at financing institutions also need to be capacitated to understand EI and the importance and opportunities for benefits from EI management and rehabilitation.
- It is important to be ambitious/confident to take advantage of opportunities presented by the funding – there are increasing opportunities for EI investment for example linked to climate finance – need to "go for it and leap in there" to develop a good track record and open doors to other funding opportunities.
- Developing a business case is increasingly important – being clear about what benefits are and what returns can be expected. There might not always be a financial benefit, but it is important to collect the evidence to support the business case and funding application. The programme implementers need to collect evidence to show the tangible benefit of the program on EI management.
- The method of building a business case around investment e.g. modelling flows/hydrology – seems to be increasing amongst funding recipients and funders. In the case of Umhlangane and wetland restoration initiatives – eThekwini Municipality had built into the proposal the need for a baseline assessment of flood attenuation capacity of wetland because that was the big focus of the funding in addition to the water purification services. At the end of the 4-year programme the assessment was repeated, and it was possible to demonstrate benefits/ impacts due to the nature of the wetland's functioning capacity. In other ecosystems where response times are slower, there is a tendency to adopt output level indicators and quantifiable measures e.g. jobs created, or hectares cleared.
- The investment in long term EI conservation or rehabilitation projects have so many additional benefits compared to traditional engineering solutions. Some of these are:
    - Improved habitat, water quality, security
    - Better protection of grey infrastructure
    - Advocacy role established in those involved.
    - Community upliftment and local economy stimulation.
    - Development of cyclical processes which create further economic opportunities.
    - Increased resilience of cities and their communities.

The Klein Swartberg Initiative

This case focusses on a small-scale ongoing initiative in the town of Ladismith, located in the Western Cape, where the local businesses most directly threatened by water insecurity have been investing back into the catchment area which supplies them with water, thereby supporting a circular economy. The catchment area lies in the Klein Swartberg Mountains, and a contribution is being made to securing Ladismith's water supply through the clearing of IAPs. An application developed by SAEON is being used annually to rapidly estimate the water savings associated with the clearing. This evidence of the outcome of the EI intervention is then reported to local businesses funding the interventions, and the reported verified area cleared, and annual savings of water plays a key role in sustaining the funding. The initiative aims to strengthen partnerships and contributions from the private sector and civil society and has been working with key farmers to develop a locally tailored approach involving the mobilisation of temporary farm workers during periods when the demand for labour on the farms is lowest. Key stakeholders in the case study are the Mountain Club of South Africa (MCSA) (through which the participation of volunteers is promoted), local businesses in Ladismith (notably Ladismith Cheese and Lactalis), local farmers from the areas surrounding Ladismith, the Kannaland Municipality, Cape Nature and the Gourtiz Cluster Biosphere Reserve. The results of the key guiding questions are outlined below.

1. <u>What are the quantifiable ecosystem service returns (outputs and outcomes) from EI interventions associated with the implemented initiatives, especially those services related closely to water security?</u>

Outputs:

- Clearing of approximately 47 000 hakea (*Hakea sericea*) trees and 303ha of hakea-infested mountain catchment immediately upstream of Ladismith town. Prior to clearing, the cleared area comprised a mosaic of low to medium infestation with some small patches of high infestation.
- 209 person days of employment was provided for local individuals who depend on temporary work and are often without work during times of the year when the demand for labour on local farms is relatively low.

Outcomes:

- Freeing up an estimated 10.7 million of litres of water per year, now available to supply Ladismith town located downstream.
- Reduced water security risks to Ladismith Town and its businesses, particularly during droughts, the frequency and intensity of which are projected to increase with climate change. Ladismith is an arid-zone town entirely dependent for its water supply on the much wetter mountains nearby, where the clearing of hakea took place.
- Reduced risks of the occurrence of extreme fires. Hakea, which is well adapted to intense fires, substantially increases the combustible biomass compared with the indigenous fynbos.
- Significantly reduced risks to the mountain's biodiversity, in particular to the hydrologically vulnerable seep wetlands and their dependent species, most notably the Endangered Ladismith Yellow Keurtjie (*Stirtonanthus chrysanthus*) confined entirely to mountain seep wetlands north of Ladismith, which is exactly where the clearing has been focussed.

The above outcomes have all contributed (albeit still on a small scale) to multiple aspects of resilience of the social-ecological system, including: (1) increased resilience for Ladismith's mountain ecosystems and dependent businesses and households in relation to risks from droughts and wild fires, both of which are projected to intensify generally as a result of projected global climate change; (2) increased institutional resilience through strengthened partnerships and contributions from civil society (Mountain Club of SA), private sector (two of the largest businesses in Ladismith and 3 local farmers) and an NGO, the Gouritz Cluster Biosphere Reserve (GCBR); (3) increased economic resilience of the initiative through accessing of multiple funding streams and the main businesses benefiting from water resources investing back into the management of the ecosystem supplying the water, thereby supporting a circular economy and reducing reliance on external funding sources; and (4) increased household resilience for temporary workers (albeit for an extremely small number of individuals) through an additional income source at a critical time of year.

2. Which role-players were involved in the respective aspects of planning, funding, and implementing EI investments?

The initiative emerged out of the volunteer clearing of hakea by three MCSA members living in Ladismith, who were motivated by their desire to contribute to the ecological health of the mountain ecosystems which they enjoy, while at the same time appreciating the physical experience involved in the clearing. The MCSA has remained the champion for the initiative, with one member taking a lead role in terms of ongoing supervision, reporting and liaison with the funders. The initiative was precipitated by an appeal made by the MCSA members for volunteers to participate in a hakea clearing event in Ladismith's mountain catchment in early 2019. A farmer responded to the appeal and proposed that while not participating themselves in the clearing day, they would sponsor some of their temporary workers to do so. This led to the farmer approaching two other farmers, and the three farmers jointly sponsored three days of clearing. The success of this clearing provided a tangible "proof of concept" which was then taken to the two largest businesses in Ladismith as potential sponsors and as expanded in Section 4, this was key in securing their first commitment to funding, which continued for two subsequent years (as expanded upon in the following section). This sustained commitment was aided by the involvement of an NGO (GCBR) who provided monitoring, quality-control, and reporting input in the second year of the initiative and a reporting system which continued to be applied in the following two years.

It is important to note, however, that poor service delivery in town, including interruptions to both electricity and water supply have indirectly influenced the readiness of businesses to contribute to ecological infrastructure maintenance. In terms of the extensive electricity supply load-shedding, all local businesses are having to contend with massive diesel bills, while for assured water supply one of the Ladismith business shared how they have been forced to become directly involved in monitoring in order to avert critical interruptions to their supply. This reflects the national trend of the private sector being forced to step into areas that are generally the responsibility of the state in most countries (Naidoo and Sguazzin 2023). This is likely to contribute positively to increased awareness amongst businesses of the limitations of a one-dimensional focus on grey-infrastructure. Nevertheless, as businesses become increasingly burdened financially by the state's neglect of grey infrastructure, practically it will become increasingly challenging for these businesses to contribute financially to EI.

3. How relevant are the returns described earlier to key role-players, in particular for private sector role-players?

The water yield benefits described above are highly relevant to downstream farmers and businesses in town, who depend entirely on the water supplied by the mountain catchment where the hakea clearing took place. The two primary sponsors of the hakea clearing are the two largest businesses in town as well as its two largest water users, further emphasizing the relevance of this increased water yield. One of these businesses described how they recognize that they are a major water consumer who drives daily water saving initiatives at plant level, not just for the future existence of the business but also for the benefit of the rest of the town's water users. Prior to the initiative, they saw upstream areas as being largely out of their control and not their speciality, and therefor they were glad for the opportunity to support an initiative focussed on addressing a key upstream issue.

For the two business sponsors, the water security, biodiversity, and job creation contributions all have relevance to the stated commitments from both companies in terms of general sustainability and corporate social responsibility. Thus, their investment in EI through the initiative is seen as contributing positively to achieving these stated commitments.

For the contributing farmers, the job creation contribution has relevance to their expressed desire that their temporary workers are able to access employment during quiet times of the year. An additional opportunity afforded by the initiative was to contribute to the general good of Ladismith town and its residents, for all of whom water is essential. Also mentioned by the contributing farmers was the opportunity that participation provided for "giving back to nature", in the context of being grateful for some memorable experiences in the mountain above Ladismith in the past even if one is too busy now to get into the mountains.

For the MCSA volunteers, the contribution of the initiative to the ecological health of the mountains and associated fauna and flora (from which personal enjoyment is derived) was of particular relevance. In addition, direct active participation in the clearing itself was viewed positively in terms of meaningful engagement with a "higher purpose" and for the opportunities afforded for physical exercise and challenge, as derived from a sport (Kotze and Rebelo 2021; Kotze 2018).

4. Which funding mechanisms were applied and how did these develop? What criteria, if any, did the initiative need to meet in order to secure the funding.

The process through which funding was obtained could be described as organic and incremental rather than being initiated from the outset through a formal process (e.g. as is typical of grant applications). From the timeline of the initiative (**Table 9-15**) it can be seen that following the initial funding by local farmers, the principal funding of workers has been from two local businesses. Local in-kind contributions by local farmers and MCSA members to critical aspects of the project around managing and paying the workers and monitoring and reporting have continued throughout. The contribution of GCBR, while relatively small (**Table 9-16**), was strategically valuable, especially in allowing for reporting back to the primary funders in a "water currency" to which they could relate.

Table 9-15 Funding sources for the Ladismith hakea-clearing initiative over its four-year period thus far

Outputs and funding sources	2019/2020	2021	2022	2023	Totals
Work output:					
Hectares cleared	7	39	78	179	303[1]
Density of hakea infestation	Medium and high	Predominantly medium	Predominantly medium	Medium and low	-
Approximate number of trees cut	8 000	11 000	16 000	12 000	47 000
Person days of work completed[2]	24	45	75	65	209
Sponsorship for workers by:					
Local farmers (3 farmers)	R5 000				R5 000
Ladismith Cheese		R6 000	R10 000	R11 000	R27 000
Lactalis		R6 000	R10 000	R11 000	R27 000
Additional contributions:					
Local in-kind contribution by local farmers and MCSA members for transporting and supervising workers and administering finance and worker payment	R2 880	R5 670	R9 900	R8 970	R2 7420
Sponsorship from GCBR for equipment	R1 200		R2 400		R3 600
Sponsorship from GCBR for monitoring and reporting		R12 000			R12 000
Local in-kind contribution by MCSA members to monitoring and reporting			R8 000	R11 000	R19 000
Totals	*R15 664*	*R37 880*	*R51 425*	*R49 550*	*R121 020*

[1]Additionally, follow up clearing of the 46ha cleared in 2019-2921 was also undertaken during the course of 2022 and 2023.

[2]The total number of individuals working fluctuated from year to year, ranging from 9 to 14

5. How was the funding structured (organized, designed or set-up) i.e. What type of funding e.g. donations, loans, and repayments etc.

Funding was through a combination of donations and in-kind contributions (**Table 9-16**). The bulk of the funding (87%) was from local businesses and local in-kind contributions. External funding (13%) was from an NGO. No funding was obtained from government.

Funding has been for four years, with sponsorship from the two largest businesses being for the last three of these. Funding was secured on a year-to-year basis and was conditional on progress being demonstrated at the end of the previous year. Each year, one of the two main business sponsors provided the lead in responding to the request for funding, with the other following and matching the amount sponsored by the "lead business". For all three years, it was the same business responding first to the call. Funding payments were generally made towards the beginning of most years, but there was once a long delay, for which the key farmer who was administering payments "bridged the gap" until payment had been made.

Table 9-16 A summary of the sources of funding for the Ladismith hakea-clearing initiative over the period 2019-2023, detailed in Table 1

Source of funding	Amount in Rands	Percentage of total amount
Donations from local businesses	R59 000	49%
Local in-kind contribution by local farmers and MCSA members for transporting and supervising workers, administering finance, worker payment and monitoring & reporting	R46 420	38%
Donations from an NGO, Gouritz Cluster Biosphere Reserve	R1 560	13%

6. What is the business case for private sector investment in water-related EI within the initiative and how was this developed and communicated amongst the role-players?

The business case for the farmers and local businesses was built almost entirely around investing in their own water security. An initial attempt was made in 2019/2020 by a volunteer from the Mountain Club of South Africa to communicate this concept, which proved unsuccessful. Prompted by a call for volunteers, the lead farmer suggested the idea of sponsorship of three clearing days and also persuaded two other farmers to contribute. Their commitment was secured with MCSA members agreeing to supervise the three days. The lead farmer (who is also the owner of an agri-processing business in Ladismith which dries fruit) then called a meeting with Ladismith Cheese and Lactalis in 2021 and successfully pitched the concept and they agreed to fund workers in that year. Ladismith town was lacking any formal business forum at the time through which the meeting could be called, and instead the meeting was arranged through informal channels, drawing on the relationships that the lead farmer already had with key individuals in the two businesses.

Gaining the evidence needed to strengthen the business case required that the volume of water freed up by the clearing be estimated. To this end, the application developed by Glenn Moncrieff of SAEON (https://gmoncrieff.shinyapps.io/aliens_waterloss/) was used to roughly estimate the water savings associated with the clearing. This takes into account the species and its age class, density class and climatic context, and is based on the method of Le Maitre et al. (2016), which draws from a considerable body of research on the effects on surface water runoff of a wide variety of invasive alien species in multiple contexts and refines the earlier method of Le Maitre et al. (2000). The estimated volume of water freed up by the clearing was communicated to the funders by an MCSA member in a report compiled annually. The report also included a map showing the specific area cleared and photos of the clearing underway. This assisted in providing evidence to the funders that the funding was achieving its intended purpose and was not being wasted.

7. To what extent has the EI investment contributed to social justice?

A high proportion (>70%) of the donor funding for the initiative was for wages for workers. These were mainly temporary workers, with most of the work provided during the “quiet” periods on the farms when work is in shortest supply and temporary workers are most vulnerable to financial hardship. The initiative therefore contributed to the resilience of participating workers. However, as the initiative’s overall budget was small, the number of paid days was relatively small. While workers were able to gain new experiences and potentially increase their employability, the initiative did not capacitate a contractor or the development of any enterprises. In addition, given that the work is physically extremely demanding and the pool of workers from which the project draws are all male, no females were represented in the workforce. Thus, the overall direct contribution of the initiate to social justice has been limited.

Nevertheless, the contribution of the initiative to reducing the risks of both water shortages during drought conditions and extreme fires can be seen to have had a particular contribution to Ladismith's most materially-poor residents. This is in the sense that extreme events, be they fires or critical water shortages, generally have a proportionally higher impact on the poor than the wealthy, who are more "sheltered" from their effects, e.g. through insurance and having greater material means to take mitigatory action. Furthermore, when economic activity contracts, as typically occurs to the agricultural sector in droughts, unskilled labour is usually shed to a greater degree than skilled labour. Thus, once again, it is the poorest people who are most severely affected by extremes.

8. What key lessons were learnt from the initiatives and, taking these lessons into account, how scalable is the case?

Key lessons:

It is critical to build relationships and trust. While stating the obvious, relationships and trust are foundational, particularly for initiatives which evolve organically and do not have many explicit formal mechanisms to structure interactions and uphold accountability.

Start small and grow incrementally. Allied with the "organic" development of the initiative is the need to build it incrementally rather than being in a rush to demonstrate quick results. Small initial successes were used to leverage the "buy in" of additional role-players and their associated resources. Here it is important to acknowledge that the initiative is still small and growing.

Use peer-to-peer/ business-to-business interactions to draw in new partners. As described earlier, a local business proved much more effective in persuading the two major businesses in town to participate in the initiative than the initial attempts at persuading by a representative of the Mountain Club of South Africa.

Build on existing local strengths and arrangements (e.g. an existing pool of "work-fit" temporary workers for which arrangements for transport and payment already exist) rather than establishing these from scratch. This was particularly the case given the incremental development of the project, its limited budget and the degree to which it relied on in-kind contributions.

Align timing of work with the local situation. Allied with the locally-based incremental development of the initiative is the need to harmonize the initiative with the local situation. In particular, this included focussing the work activities of the initiative as far as possible during "quiet" periods in the local "calendar" of work activities.

Communicate outputs and outcomes to partners to promote accountability, build trust and confidence in the initiative and effectively grow and maintain support.

Learn from failures and remain adaptive. The initiative was born out of a failure to hold the state responsible for continuing to clear IAPs in Ladismith's mountain catchment, which is state-owned land. This, in turn, led to seeking alternative funders, with a focus on those who were anticipated to benefit from the clearing. This ultimately resulted in funding (albeit small amounts) being secured from several of the key downstream water users.

Major funding from formalized grants or the government should not be seen as a necessary prerequisite for investment in EI. By using existing local mechanisms, ways can be found of "stretching the Rand" and harnessing in-kind contributions, so as to advance surprisingly far in achieving the intended outcomes of the initiative.

Scalability of the initiative:

Based on the contribution of the initiative thus far and the lessons learnt, it would appear to provide the basis for serving as an innovative "seed" which is not currently mainstream but has the potential to be "scaled out" and "scaled up", as described by van Velden et al. (2023).

In terms of scaling out across Ladismith's mountain catchments, there is still at least 2 000 ha remaining where clearing of hakea is required, and into which the initiative could be expanded. A formal assessment of this area has yet to be undertaken, and this is recommended for planning and budgeting purposes given that the level of infestation appears from informal observation to be very heterogenous across this area.

In terms of scaling out more broadly, it is noted that there are several small towns in a similar situation to Ladismith, with residents and local businesses strongly dependent on their adjacent mountain catchment for their water supply. Some of these towns already have a core of volunteers engaged in IAP clearing initiatives. In a few cases, the volunteer initiatives are well developed and the outcomes are being reported on social media in a comparable fashion to those of the Ladismith initiative, e.g. as reported for the Wild Restoration Greyton "Helihack" week (https://www.wildrestoration.org/the-greyton-mountain-project). However, in other towns, such a core group is absent or in need of strengthening. A recently formed action and learning network for local groups involved in invasive clearing within the Cape Floristic Kingdom could potentially play a role in helping facilitate the strengthening of weaker groups. The network, which is hosted by Wild Restoration (https://www.wildrestoration.org/), seeks to promote sharing of information and practices, re-energising individuals and collaboration across local groups.

A platform which may potentially assist with scaling out is a project set up on iNaturalist, the Ten Thousand Tree Mountain Fynbos Challenge, where different groups/initiatives/individuals who are widely scattered across the Fynbos Biome are able to post information on IAP clearing events which they undertake, and which works towards a common target of clearing 10 000 invasive alien trees within Mountain Fynbos during the course of a month. (https://www.inaturalist.org/projects/the-ten-thousand-tree-mountain-fynbos-challenge). To date, over 150 000 trees cleared trees have been recorded from a total of 138 posts on the project, of which 31 are from the Ladismith initiative.

In terms of scaling up, a key aspect is to build longer term commitment to the initiative from the existing role-players so that its long-term fate will be less dependent on individual champions. A further aspect is securing more formalized and binding involvement of CapeNature to assume greater responsibility in the initiative. This would include: (1) supervision of the sponsored teams, thereby freeing up volunteers to focus on the remotest areas; and (2) oversight in terms of best practices being followed with the clearing. Regarding CapeNature, the potential exists for influence at a higher level in the organization in terms of policy and strategy relating to how the organization better engages with private enterprise and other role-players around the control of IAPS in the mountain catchments for which CapeNature have a management responsibility. However, with all of these possibilities for scaling up, it is important to recognize the existing informal and flexible structure of the initiative which has allowed it to grow and adapt. Thus, any scaling up needs to be careful not to become overly constraining on the initiative, as might occur if efforts to formalize current arrangements amongst the different role-players become too rigid. The same principle also applies to the local municipality, whose active participation in the initiate is also seen as desirable for the long-term sustainability of the initiative.

As described earlier, the business case for the initiative was focussed strongly on water supply for local users in Ladismith town. However, the initiative also has clear biodiversity benefits at a local, regional, and international level. This is given the floristic uniqueness of the area under threat, the many threatened endemic species it contains (including, amongst others, the Endangered *Stirtonanthus chrysanthus*, Critically Endangered *Psoralea rubicunda* and Vulnerable *Protea aristata*) and the international importance of the Cape Floristic Region, within which it falls. The control of hakea also benefits aquatic fauna of the Ladismith's mountain catchment area, including the Near Threatened Slender Redfin (*Pseudobarbus tenuis*). Thus, the initiative could potentially be a candidate for international funds for supporting biodiversity priorities.

Ultimately, in scaling out and scaling up the initiative, potential exists for developing a "bankable project" which includes both biodiversity and water security linked with climate change adaptation in the package of outcomes to "sell" to additional funders/donors.

Wolseley Water Users Association EI Coordinator Initiative

Key obstacles hindering the practical operationalization of EI investment at a local scale are a potential lack of trust, discontinuity (e.g. with potential funding sources changing from year to year) and the difficulty encountered by local role-players in maintaining momentum in the face of multiple competing demands. The appointment of an EI coordinator into a local institution to support the maintenance and rehabilitation of EI has proven to be an effective means of building trust and maintaining continuity and momentum (Gelderblom et al. 2021). In addition, while the concept of blended funding/finance is conceptually attractive, it can be difficult to operationalize locally, and local EI coordinators offer a promising practical means of facilitating this blending.

In 2017, through facilitation by WWF, long-term private sector funding from Woolworths was secured to appoint a local EI coordinator, Ryno Pienaar, into the Wolseley Water Users Association (WWUA), a position which he currently still occupies. To date, he has coordinated extensive clearing of IAPs in the WWUA operational area in the upper Breede River catchment. This investment in EI has been funded from multiple sources including Coca-Cola, LandCare, Department of Environmental Affairs and Development Planning, Western Cape Government, Breede-Olifants Catchment Management Agency, and the WWUA itself. The primary funding source has shifted several times over time, but continuity has largely been maintained, thus allowing for systematic IAP control with timeous follow-up clearing.

The case seeks to document how the WWUA EI coordinator position built on existing private-public sector partnerships, and how this position and its funding have evolved over time. While the ecological outcomes arising out of the EI coordinators work will be briefly mentioned, the primary focus of the case will be on *how* these were achieved.

1. <u>What are the quantifiable ecosystem service returns from EI interventions associated with the implemented initiatives, especially those services related closely to water security?</u>

The principal ecological output of the initiative is that 2 018 ha of riparian area in the upper Breede River catchment centred around the town of Wolseley has been cleared and kept clear of invasive alien (IA) trees. In some of this area (approximately 60ha) the initiative also included active re-establishment of indigenous vegetation along the riverbanks to aid in the ecological recovery process.

An institutional output of the initiative has been greater landowner commitment to sustained follow-up clearing of IA trees, though, for example, contacting landowners directly to remind them when

follow-ups are dues and ultimately "nudging" them into a culture of budgeting for follow-ups (Gelderblom et al. 2020). Overall, 120 farmers have formally committed to water stewardship contracts (WWF, 2023).

The principal outcome reported from the clearing of IA trees in the initiative is of 811 900 m^3 of water saved since clearing started (WWF, 2023). The focus on water quantity in terms of reported outcomes is not surprising given the well-demonstrated effect that IA trees have in diminishing streamflows (Cullis et al. 2007).

Although not reported on specifically, and unlikely to be as marked as the effects of water quantity, the IAP clearing may also have contributed to slightly improved water quality. This is based on the potential negative effects of IA trees on water identified by Chamier et al. (2012).

The generally negative effect of dense infestations of IA trees on biodiversity is well documented (Wilson et al. 2014; Richardson and van Wilgen 2004; Richardson et al. 1997). Thus, the 2 018 ha of riparian area which has been cleared and kept clear is likely to have had a significant positive effect on the maintenance of biodiversity in the upper Breede catchment. These positive effects are further confirmed by assessments at individual sites within the 2018 ha area, including at the Kluitjieskraal Wetland. The positive effects on biodiversity of maintaining the Kluitjieskraal Wetland in a cleared state have been documented by Kotze et al. (2023). This includes a positive contribution for several Red-listed plant species, including the Vulnerable *Aponogeton angustifolius*, Critically Endangered *Leucadendron chamelaea*, Vulnerable *Leucadendron corymbosum*, Endangered *Monsonia speciosa* and Vulnerable *Skiatophytum tripolium*as, well as for avifauna, including the Regionally endangered African Marsh Harrier (*Circus ranivorus*) and the Endangered Black Harrier (*Circus maurus*).

2. How relevant are the returns described above to key role-players, in particular for private sector role-players?

The water quantity returns of the initiative have tremendous relevance to the involved farmers (who depend strongly on the water for irrigating their crops) and to Wolseley Water Users Association (WWUA) who represent these farmers and other local water users. It is also of particular relevance to the Breede-Olifants Catchment Management Agency (BOCMA) who represent the flow requirements of downstream ecosystems and water users. It has further relevance to LandCare, particularly in terms of aligning with the land and water stewardship goals of this programme, while the joint returns in terms of water yield and biodiversity are of high relevance to WWF and the principal funder of the local EI coordinator, Woolworths, as part of its commitment to sustainability.

3. Which role-players were involved in the respective aspects of planning, funding, and implementing EI investments?

The Wolseley local EI coordinator initiative builds strongly on a very well-developed base of partnerships, trust and concrete action which were already well established when it was initiated in 2017. The first of these is the partnerships forged between LandCare and farmers in the Wolseley area focussed on supporting the clearing of IA trees in riparian areas, and which began in the early 2000s and continued growing gradually up until commencement of the initiative. The second key partnership is between WWF and Woolworths, which began in 2008 working with suppliers and customers to develop a culture of sustainability all the way through the Woolworths value chain (WWF, 2023). Some of Woolworths important suppliers are farmers in the Wolseley area, highlighting a key overlap between these two partnerships, from which the initiative commencing in 2017 could logically be developed. A further factor contributing to the base on which the initiative grew was the

Water Risk Filter process conducted by Marks & Spencer in the UK, which played a key role in supporting Woolworth's now ongoing water stewardship work in the upper Breede River valley and elsewhere in South Africa (NBI, 2019).

Once established and running, multiple role-players have been involved, including >10 different funders (see Question 4). The large number of different funders and the fact that many had a duration of only a year or two, highlights the tremendous need for continuity and coordination. For EI investment in general, key obstacles hindering the practical operationalization of EI investment at a local scale are a potential lack of trust, discontinuity in the funding stream and the difficulty encountered by local role-players in maintaining momentum in the face of multiple competing demands. The appointment of an EI coordinator into a local institution to support the maintenance and rehabilitation of EI has proven to be a very effective means of building trust and maintaining continuity and momentum (Gelderblom et al. 2021). In addition, while the concept of blended funding/finance is conceptually attractive, it can be difficult to operationalize locally, and the local EI coordinator offered a practical means of facilitating this blending from multiple sources.

4. How was the funding structured (organized, designed or set-up) *i.e.* What type of funding e.g. donations, loans, and repayments etc.

The Wolseley Water Users Association (WWUA) has been the main hub through which much of the funds are administered, and the local EI coordinator is "hosted" by the WWUA. In addition, Breedekloof Wine and Tourism have also contributed to administering some of the funds. Woolworths continued to fund the coordinator, who in turn continued to secure and coordinate considerable funding for the IAP clearing and restoration work itself (**Table 9-17**).

Funding has been accessed from multiple sources, for which the largest proportion is from government grants (**Table 9-17**), through LandCare, Department of Forestry Fisheries and the Environment (DFFE) and Department of Environmental Affairs and Development Planning, Western Cape Government (DEADP) and the South African National Biodiversity Institute (SANBI). The next greatest contribution was from social enterprise investments (Reforest'Action), which funded the planting of indigenous trees and shrubs in some of the areas cleared of IAPS through selling this investment as carbon credits on the global market. This was followed by private enterprise grants from two businesses (Coca-Cola and Hilton Hotels) for clearing IAPs, and next by the BOCMA (**Table 9-17**).

Table 9-17 Primary sources of funding for work undertaken through the Wolseley local EI coordinator initiative for the overall period 2017-2023

Category of funding	Amount	Percentage
Government grants	R28 573 903	67.6%
Breede Olifants Catchment Management Agency (BOCMA) grants[1]	R2 743 000	6.5%
Wolseley Water Users Association grants	R100 000	0.2%
Private enterprise grants	R4 135 525	9.8%
Social enterprise investments	R6 000 000	14.2%
NGO grants	R700 000	1.7%
Total:	R42 252 428	100%

[1]The funding source for the grants from BOCMA can be taken as a split between national treasury and water levies, which each constitute 50% of BOCMA's income.

[2]The social enterprise specialised in reforestation and was a B Corp-certified social enterprise, which is a for-profit business that has been certified by the non-profit organization B Lab in terms of verified social and environmental performance,

public transparency, and legal accountability to "balance profit and purpose" (https://www.greeneconomylaw.com/social-enterprises-b-corps-benefit-companies-esg)

Much of the funding for the initiative was sourced through responding to calls for work through an open-tender processes, including calls from government as well as calls from private companies, such as that from Coca-Cola. The EI co-ordinator played a central role in "watching out" for potentially relevant calls and then, in collaboration with partners, developing and submitting proposals. Partners also contributed to alerting the EI co-ordinator to potential funding sources, the most notable of these being LandCare alerting the EI co-ordinator to Reforest'Action as potential source of major funding. While it appeared a "long shot" at the time, the application for this major source of funding was successful.

5. Which funding mechanisms were applied and how did these develop? What criteria, if any, did the initiative need to meet in order to secure the funding.

In the timeline of funding sources shown in **Table 9-18**, it can be seen how the funding sources have shifted significantly (**Table 9-18**). Although government funding has remained an important contributor in all years, its relative contribution has fluctuated a lot, and it has noticeably declined in the last three years. This gap has been filled by a "new arrival" in 2021 of a social investment contribution, with its proportional contribution increasing over the three-year period, to become the greatest contributor in 2023.

The short duration (sometimes only a year or two) of many of the funding sources presented a challenge for maintaining continuity over time. However, the fact that in all years except for the first year (2017), multiple streams of finance have been accessed for the year has helped stabilize overall funding and maintain continuity over the years, thus allowing for systematic IAP control with timeous follow-up clearing. Further contributing to this continuity is the fact that most of the funders have generally been closely aligned with the central focus of the EI investment, namely the clearing of IA trees in riparian areas. For all of these funders, the key criterion for securing funding through the initiative is demonstrating that the IA trees have been effectively cleared. However, the scope of EI investment work has expanded in recent years, in particular with the arrival of a funder specifically focussed on replanting of indigenous trees and shrubs in the cleared areas.

Table 9-18 Primary sources of funding for work undertaken through the Wolseley local EI coordinator initiative according to the individual years, 2017-2023

	2017	2018	2019	2020	2021	2022	2023
Total funds:	R3 500 000	R2 014 000	R10 104 293	R7 654 254	R8 900 880	R7 494 000	R5 585 000
Category of funding							
Government grants	100%	35.5%	58.5%	87.8%	66.3%	54%	32%
BOCMA grants	0%	24.8%	4.9%	6.5%	0%	6%	14.3%
WWUA grants	0%	5%	0%	0%	0%	0%	0%
Private enterprise grants	0%	0%	36.6%	5.7%	0%	0%	0%
Social enterprise investments	0%	0%	0%	0%	33.7%	40%	53.7%
NGO grants	0%	34.8%	0%	0%	0%	0%	0%

For funding sourced from the private sector, WWF have played an important role in helping to pitch the proposal in a way that "spoke" to the particular criteria and preferences of the funder. For this, WWF were able to draw on their long-standing experience of working with the private sector.

6. What is the business case for private sector investment in water-related EI within the initiative and how was this developed and communicated amongst the role-players?

The business case which was developed for the establishment of the EI coordinator post was based strongly around sustainable production, water stewardship and reducing water-related risk. Once established and running, the emphasis of the business case varied depending on the particular donors being approached, but the most prominent themes running through all of these was that of water security, water stewardship and reducing water-related risk, allied with poverty relief.

From what can be gleaned, the business case put forward to funders was not generally based on detailed quantified evidence of outcomes but did make good use of the tangible results already achieved in preceding projects in the upper Breede catchment. Drawing the attention of potential funders to this existing "good track record" helped increase confidence that any further funding provided would not be misspent and would to be used to continue with what had already been achieved but across a greater spatial extent of riparian area and therefore amplifying the outcomes.

7. To what extent has the EI investment contributed to social justice?

Through the initiative, 109 445 days of employment were provided. Several of the contracts contributing to these days had >50% representation of females amongst the workers. In addition, through the initiative, seven SMMEs were established, owned, and operated predominantly by individuals from historically disadvantaged groups. Thus, overall, the direct contribution of the initiative to social justice is substantial.

In addition, as elaborated upon in the Ladismith case, the increased water yield resulting from the initiative is anticipated to have buffering effect during drought periods, thus potentially reducing the degree to which agricultural production contracts and causes labour to be shed and vulnerable unskilled workers to lose their jobs. Therefore, the initiative also potentially contributed indirectly to social justice, but this would be contingent on how the water which is freed up is allocated and used.

8. What key lessons were learnt from the initiatives and, taking these lessons into account, how scalable is the case?

Key lessons:

Where they already exist, it is important to build on existing partnerships, including private-public sector partnerships, and the long-established relationships of trust associated with these partnerships. This is particularly so considering how trust often takes many years to build.

It is of great value that the local EI coordinator be housed within a local organization with strong local credibility. This is linked with the importance of trust, and the need for the EI coordinator to be seen, as far as possible, to be part of the local community. It also links with the need for encouraging local ownership of the EI investment.

A high level of flexibility is required to accommodate multiple funding sources. This is enabled by having a dedicated individual who is specifically focussed on EI investment, well connected with key role-players and not constrained institutionally from working easily across multiple projects and organizations.

Without the focussed attention given by a local EI coordinator to the considerable planning, coordination and administration required for such extensive IA tree clearing operations from so many different funding sources, the continuity of work and sustained momentum achieved is likely to have

been much lower. Furthermore, the total funds secured would have likely been considerably less and the scale of work carried out to improve the state of the EI therefore much smaller.

The Wolseley initiative's diverse mix of partners, ranging from local to provincial and national, further contributed to its capacity for accessing funding from a variety of sources. For local initiatives, the process of securing certain government funding for EI can be very onerous, largely placing such funds "out of reach". However, through partnerships with government organizations familiar with these procedures, such funds can be much more readily accessed. In the case of the Presidential Employment Stimulus Fund, which was launched during the COVID pandemic, the SANBI's EI4WS programme, as one of the partners of the Wolseley initiative, played a critical role in the initiative being able to successfully apply for these funds, which were used for their ongoing clearing of IAPs in the Wolseley area. SANBI were also able to contribute to the initiative's mapping of the clearing efforts through their existing engagement with a national youth employment initiative.

Scalability:

The initiative has already demonstrated significant scalability in that major funding (>R 45 million) has been secured over a long period (7 years) from multiple sources (>10) and effectively put to use at a large spatial scale (>2 000 ha of riparian area cleared), as elaborated upon in Question 1. Further demonstrating its scalability is that through the WWF-Woolworths partnership, an additional local EI coordinator has been appointed in the Koue Bokkeveld area and two more local EI coordinators are planned at additional locations (WWF, 2023). It is important to recognize, however, that a local EI coordinator is not a "silver bullet" and there are some important pre-conditions for its effectiveness and long-term viability, including the following.

- A suitable and supportive organizational "home" for the EI coordinator. The organization needs to be both functional and adequately resourced and needs to give the coordinator sufficient agency (Gelderblom et al. 2021).
- Stakeholders understand what can be done through a local EI coordinator and the potential partnerships which are linked with this coordinator and are supportive of the initiative (Gelderblom et al. 2021).
- A high level of competency on the part of the EI coordinator is required both in terms of day-to-day operations of the IA plant clearing and other EI interventions (including administration, budgeting, monitoring, and evaluation of work executed, reporting and staff management) as well as in terms of strategic planning and the "soft skills" of dealing with a diversity of stake-holders and partners.
- The EI coordinator needs to be the "right fit" for the local community, e.g. in terms of being well conversant in the local language (Gelderblom et al. 2021).
- Adequate funding is required for the EI coordinator, and for continuity, this should preferably be assured for several years.
- Preferably some existing initiatives in the local area on which to build. Without this, there is likely to be a long lead-in time for operational funding to be procured and for there to be tangible outcomes to show on the ground.

A key factor affecting the "scaling out" of any initiative such as that at Wolseley is an understanding of how to match the needs of the EI with the needs of potential funders. For example, while the Wolseley initiative was able to successfully harness a valuable income stream from the carbon credit market for planting of indigenous trees, the specific requirements and criteria of this specific market

precludes financing of IA tree clearing, which therefore needs to come from an alternative funding source. As alluded to in Question 4, through BOCMA's contribution, some funding of clearing IA trees has been from water users in the Breede catchment through water levy payments. However, as seen in **Table 9-18**, this constituted a relatively small proportion of the overall finances for the EI work undertaken. Nevertheless, the legal and institutional mechanisms are already in place (*e.g*. through an increase in the water levy) for significantly increasing the income stream from water users into clearing of IA trees in the catchment which supplies the water which is used. As funding from national treasury for EI work continues to shrink, this source of funding linked to direct water use represents a promising alternative which could become a critical means of financing IA tree clearing within the upper Breede and other key water supply catchments.

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9.2 APPENDIX 2: uMthinzima Wetland water quality data (2019 – September 2021)

Appendix 1 presents a preliminary data analysis and commentary provided to GroundTruth by Steve Terry (2023) through UUW on the uMthinzima Stream water quality between 2019 to September 2021.

As stated by UUW 2023 (Terry, pers. comm. August 2024).) "The uMthinzima River system draining into Midmar Dam below the Mpophomeni Town (**Figure 9-5**) provides a realistic indicator of how well wetlands can improve water quality. For the uMthinzima wetland, multiple sources of sewage in the town and from the frequently overloaded sewage pumpstation at the old sewage works have resulted in frequent extremely high concentrations of water pollutants, particularly *E. coli* and nutrients. This information is from monthly sampling data over many years. Downstream of the problem inputs, natural wetland enhanced assimilation through the wetland on the Zenzele community area below the R617 has had a huge beneficial effect on the uMthinzima outflow to the Midmar impoundment. This is particularly noticeable in the *E. coli* data, with several orders of magnitude improvement being achieved, but the wetland system has also resulted in highly significant benefits on removal and beneficial transformation of very important pollutants such as phosphate, ammonia and nitrate."

This date period would have included mostly data from when the uMthinzima Stream was re-directed (in June or July 2019) into the Zenzele wetland [uMthinzima Wetland below the R617 road] as part of the wetland rehabilitation work. Prior to that, only the wastewater from the old Mpophomeni WWW Pond 3 outflow (very often badly affected by untreated sewage flows, although partially mitigated by passage through pond 3/large pond, thus not completely raw sewage) was directed below the R617 into the Zenzele wetland, but was not linked with uMthinzima Stream (see pink line in **Figure 9-5**).

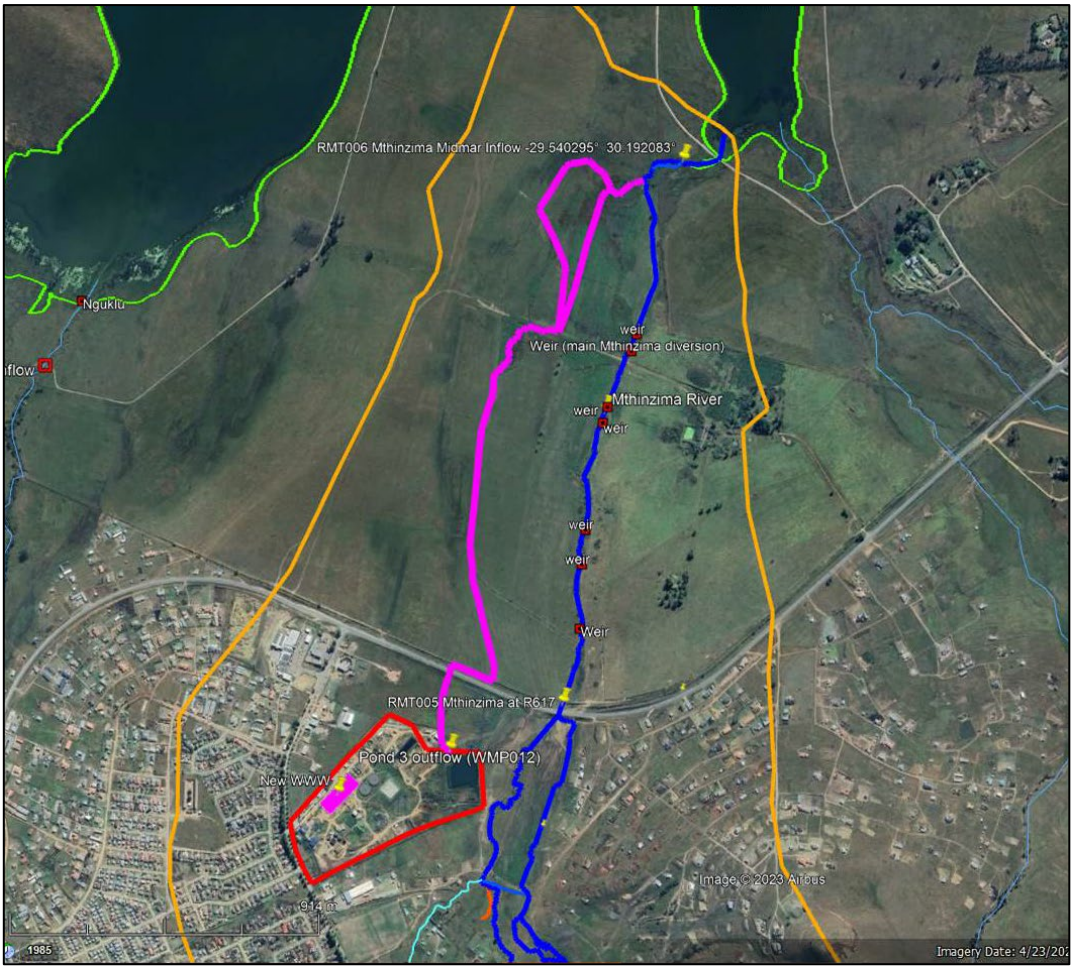

Figure 9-5 Map of the Mpophomeni-uMthinzima Wetland complex (Source: Terry, November 2023)

Selected graphs from the analysis undertaken by UUW and a summary of the *E. coli* data presented below illustrate the findings (note, the *E. coli* graph is a semi-log plot).

While the wetland benefit for total P [phosphorus] is not an immediately obvious (**Figure 9-8**), with the Midmar inflow being at times higher than the R617 uMthinzima, it should be considered that the old WWW pond 3 input (flow) comes into the stream between the two river sites thus contributing to the increased flows. The wetland improvement is therefore very important in that context.

NH_3 [ammonia] trends are more challenging to interpret as wetlands can release ammonia at times, but for the most part, the wetland is largely transforming input NH_3 (especially from the old WWW pond) into NO_3 [nitrate] and utilising at least some of the nitrogen as well. Nitrate does then however quite often go up in the outflow to the dam, but it is anticipated that (even in the absence of flow data) the overall nitrogen load is significantly reduced by the wetland, nonetheless (note **Figure 9-10**). The WWW Pond output is not expected to have much nitrate, and most results are actually below the detection limit of 0.5 mg/ℓ used for wastewater samples, the river analyses are done using a lower detection limit.

Note the strong seasonality effect for winter 2019 and 2020 -higher conductivity in winter with lower flows (**Figure 9-7**).

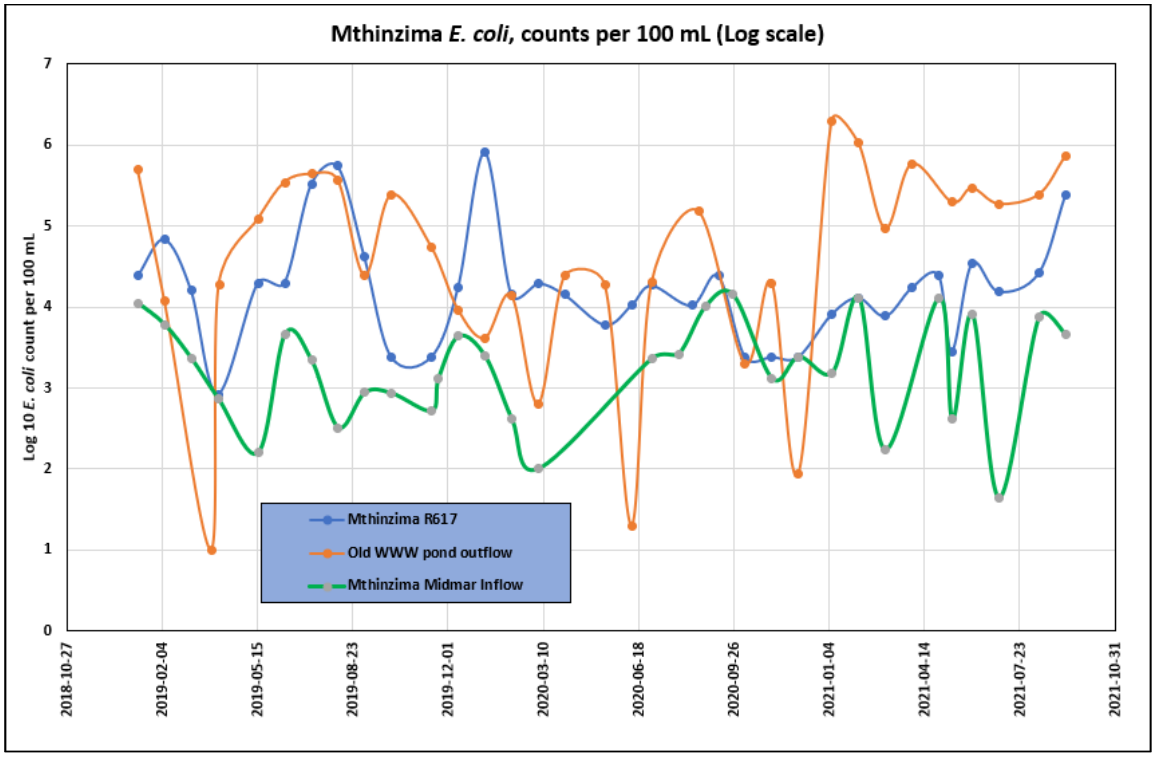

Figure 9-6 **Semi-logarithmic graph showing the uMthinizima *E. coli* counts per 100mℓ (Log scale) at three points on the uMthinzima river system (Source: Terry, November 2023)**

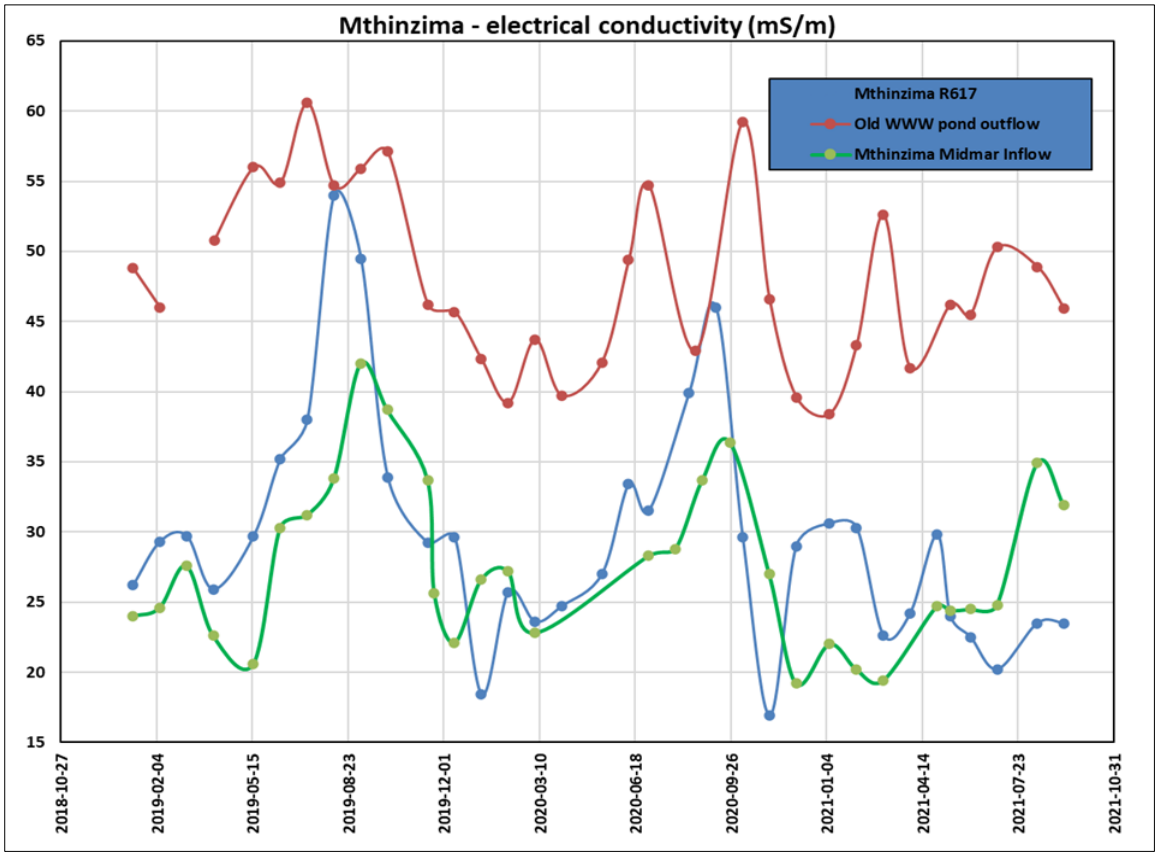

Figure 9-7 **Semi-logarithmic graph showing the electrical conductivity (mS/m) at three points of the uMthinzima river system (Source: Terry, November 2023)**

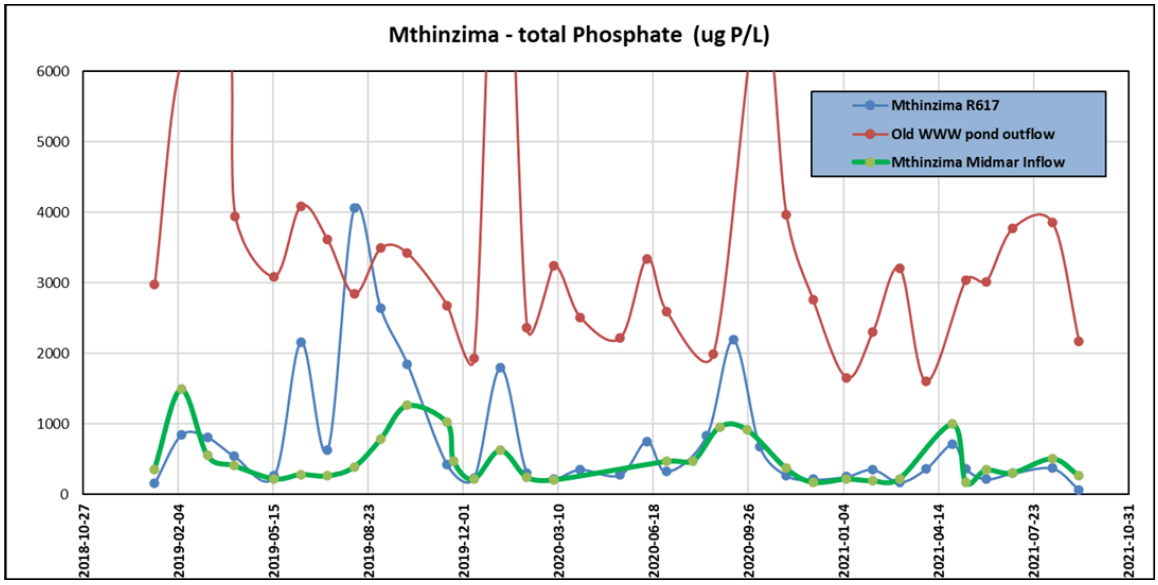

Figure 9-8 Semi-logarithmic graph showing the total Phosphate (ug P/ℓ) at three points of the uMthinzima river system (Source: Terry, November 2023)

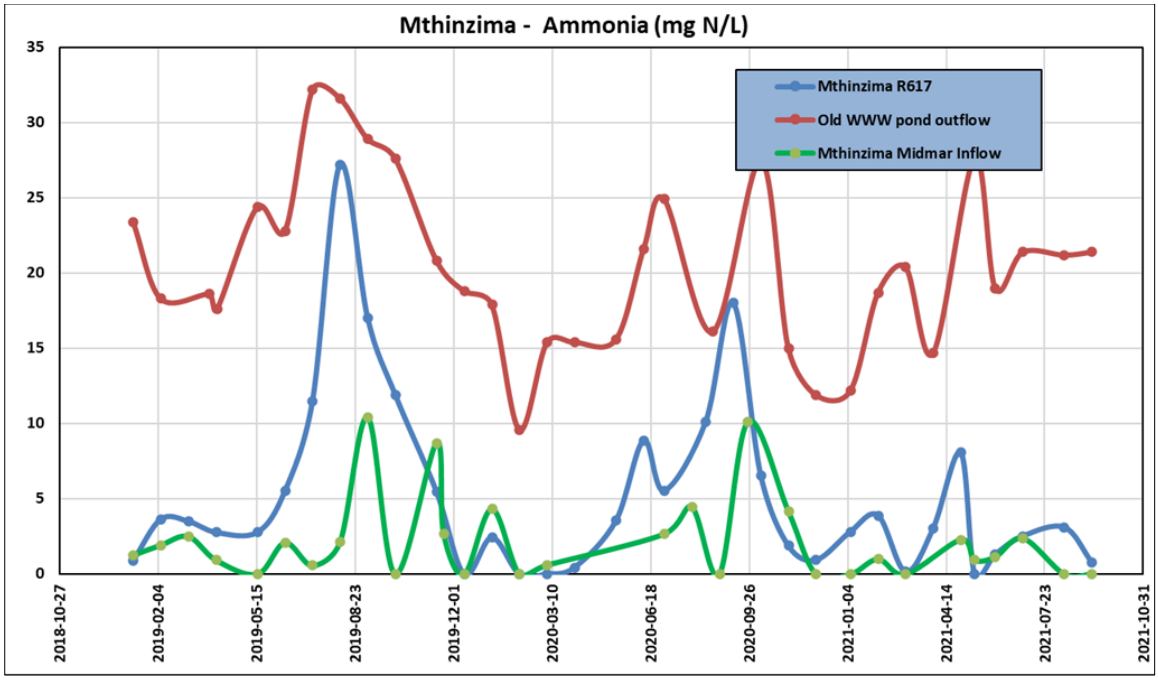

Figure 9-9 Semi-logarithmic graph showing the total Ammonia levels (mg N/ℓ) at three points of the uMthinzima river system (Source: Terry, November 2023)

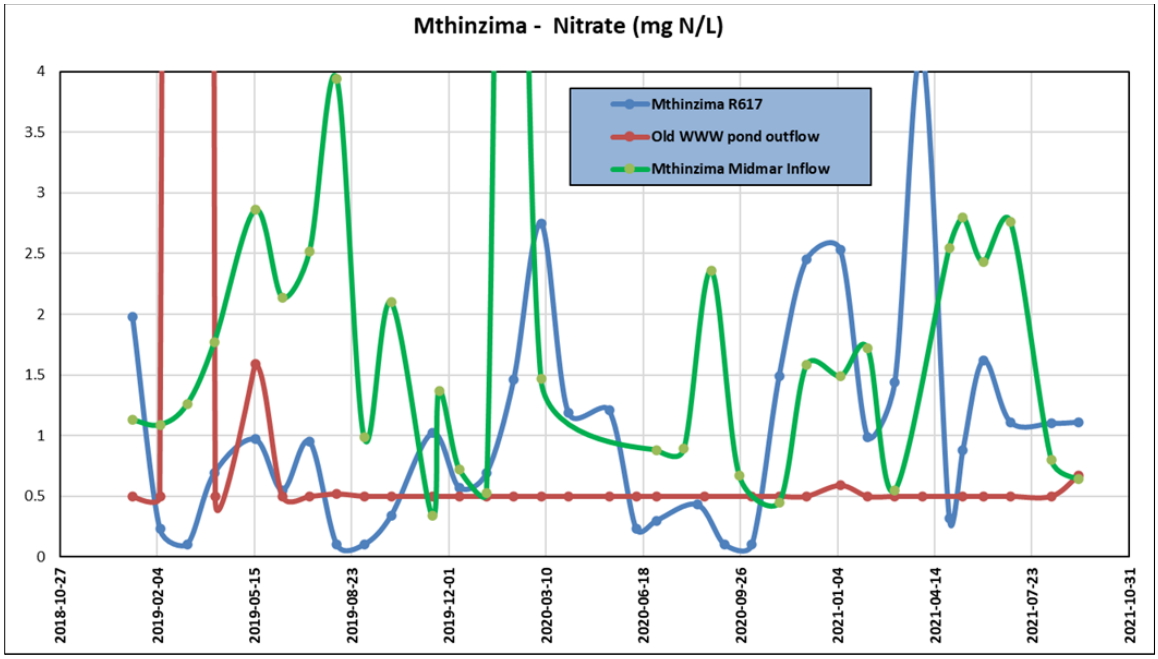

Figure 9-10 Semi-logarithmic graph showing the total Nitrate levels (mg N/ℓ) at three points of the uMthinzima river system (Source: Terry, November 2023)

Table 9-19 also provides an aggregated summary (average and a median) of the *E. coli* levels at three points of the uMthinzima River system. *E. coli* levels measured at the uMthinzima R617 point located outside the old wastewater treatment works revealed *E. coli* counts which significantly exceeded safe levels for human contact with the water, having the highest *E. coli* concentration of 81 499 most probable number (MPN) per 100mℓ, which falls in the high-risk category. In comparison, the *E. coli* levels of the uMthinzima Midmar inflow was recorded at 3915 MPN per 100 mℓ, which is significantly lower than the uMthinzima R617 point. Although various factors can attribute to the lower level of *E. coli* recorded for the uMthinzima Midmar inflow point, one of the factors that is considered to have contributed significantly to the reduction, is the improved ecological health of the uMthinzima wetland. The wetland is located between the uMthinzima Stream R617 monitoring site and the uMthinzima Midmar inflow point. Thus, based on this data, it is assumed that the wetland is contributing positively towards the enhancement of the water quality by removing/reducing pollutants in the uMthinzima Stream before it flows into Midmar Dam

Table 9-19 Aggregated summary (average and a median) of the *E. coli* levels at three points of the uMthinzima River system (Source: Terry, November 2023)

E. coli (2019 -Sept 2021)	uMthinzima R617 (n=34)	Old WWW Pond outflow (n=32)	uMthinzima Midmar Inflow (n=31)
Average	81 499	249 341	3 915
Median	17 329	54 750	2 249