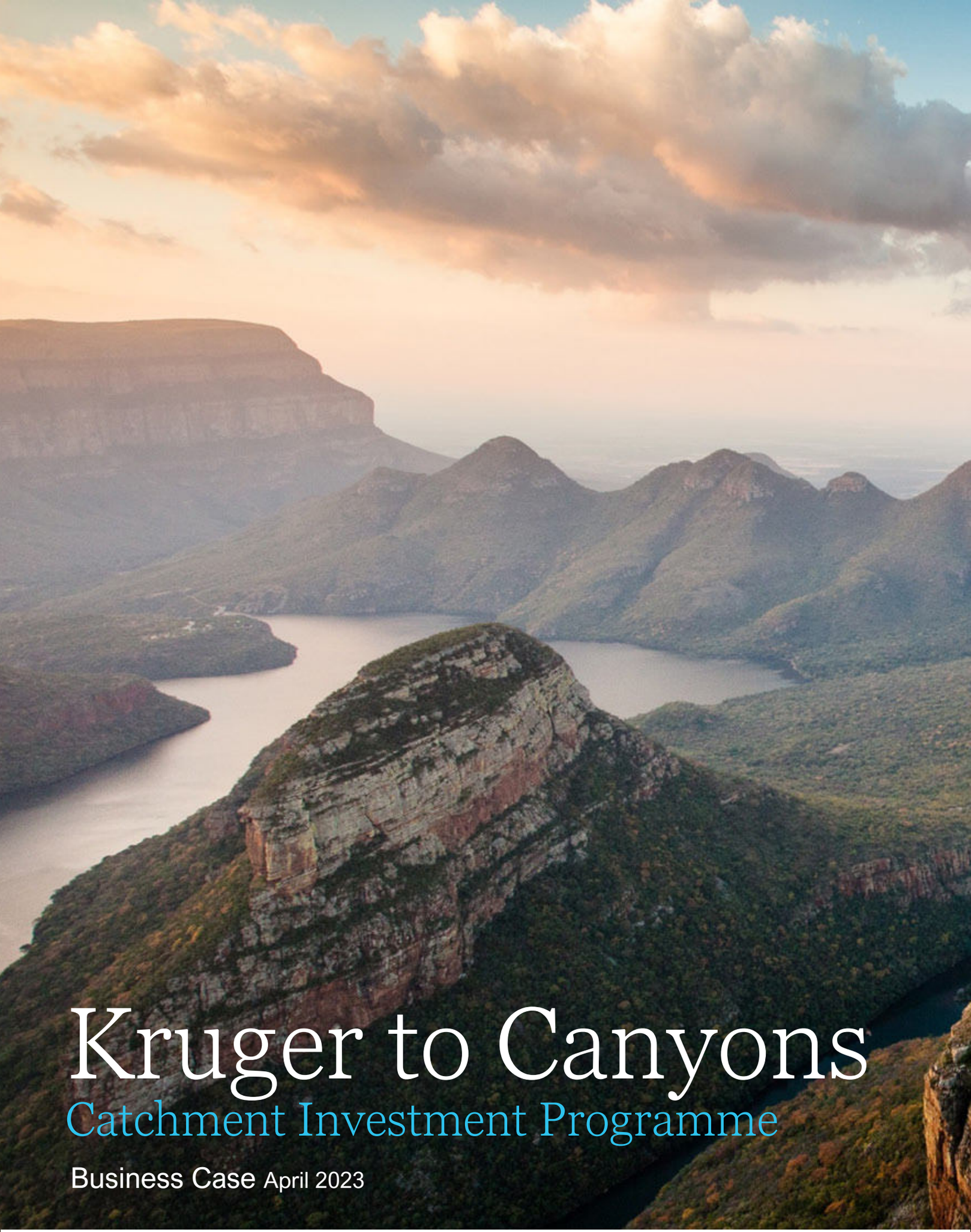

Kruger to Canyons

Catchment Investment Programme

Business Case April 2023

Nature for Water FACILITY

The Nature Conservancy

CONSERVATION INTERNATIONAL

KRUGER TO CANYONS BIOSPHERE REGION

Acknowledgements

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Contents

Executive Summary

This Business Case demonstrates that investing in nature, through an innovative mechanism such as a **Catchment Investment Programme (CIP)** improves water security, protects biodiversity and supports resilient livelihoods in the Kruger to Canyons Biosphere Region (K2C). The CIP coordinates implementation of nature-based activities following a collective action approach. The CIP enables pooling of financial resources from the public and private sector and other downstream beneficiaries to improve efficiency and deliver long term sustainable impacts.

Kruger to Canyons Biosphere Region

In 2001, the Kruger to Canyons Biosphere Region was officially ratified by UNESCO as part of the Man and the Biosphere Programme. The Kruger to Canyons Biosphere Region Non-Profit Company was established in 2011 to act as the vehicle for coordinating the implementation of Biosphere activities. To date, they have declared 25,000 ha as 'protected areas,' over 27,000 ha are under better management, more than 15,638 ha of natural areas have been restored, and in the process, 370 jobs have been created, while supporting 380 small, medium and micro enterprises.

Biodiversity

Spreading over 2.5 million ha, the Kruger to Canyons Biosphere Region is home to a high level of biodiversity. The Afromontane, forest, and grassland biomes are home to a wide diversity of South African plant, bird, and mammal species. The core areas include a large portion of the Kruger National Park, home to many iconic savanna species, including the Big 5. The Kruger to Canyons Biosphere Region also forms part of the Great Limpopo Transfrontier Conservation Area, a conservation area linking South Africa, Mozambique and Zimbabwe, covering approximately 3.5 million ha.

Source Water

The Blyde River Catchment is part of the Mpumalanga Drakensberg Strategic Water Source Area. The source of the Blyde is in the Mount Anderson catchment and Hartebeesvlakte Nature Reserve. The river flows northwards forming the iconic Blyde River Canyon, including other impressive geological features. The Blyde River then flows into the Olifants River which enters the Kruger National Park, eventually crossing into Mozambique. Good quality water from the Blyde River is crucial for the Olifants, one of the important rivers maintaining the ecology of Kruger National Park.

THE CHALLENGE

The Blyde River catchment is a complex and ecologically and socio-economically diverse area facing multiple threats from alien plant invasions, illegal mining and land-use changes from natural to degraded. **Unsustainable land-use activities upstream and increasing water demand from population growth and economic activities, in the context of increasingly variable climate, result in water insecurity and biodiversity loss.** This directly impacts

critical natural assets, it causes financial losses and economic uncertainty, and it limits people's ability to adapt to ever-changing climatic conditions.

The upper Blyde River Catchment provides important ecosystem services to downstream areas in the form of water provision, flood attenuation, erosion control, and habitat for wildlife. If these threats are not addressed, the Blyde River Catchment's important ecosystem services will continue to diminish, with drastic consequence to livelihoods, climate resilience and economic prosperity.

Threats to Water

Key threats are linked to the spread of invasive alien plants, poor land-use management practices, inadequate wastewater treatment and illegal mining. These threats degrade water quality and the reliability of water supply. Invasive alien plants use far more water than indigenous species. South Africa loses the equivalent of R6.5 billion worth of ecosystem services annually to the rapid expansion of these plant invaders[1].

Threats to Land

Poor land use practices lead to increased erosion and reduced infiltration capacity, negatively impacting groundwater replenishment. This has caused m ore than 60% of the world's original dam water storage to be lost in 30 years.[2] Due to the Blyderivierspoort Dam's small size it is not able to contain all the run off during the summer rainy season and relies on slow groundwater infiltration to maintain levels during the dry winter months.

The Blyderivierspoort Dam

Downstream water users depend on Blyderivierspoort Dam for domestic, agricultural and industrial water supply. These include commercial and community farmers, the residents of Hoedspruit town, as well as users further downstream like Phalaborwa (an extensive mining town) and the Kruger National Park. **Several times over the past 20 years, the dam level dropped, and water shortage concerns arose.**[3] These events directly threaten economic activity and domestic water security, highlighting that a water supply challenge already exists.

THE SOLUTION

The CIP is changing the business-as-usual approach to a coordinated, long term investment program. It provides a sustainable approach as a solution to these water security challenges, driven by collective action between both public and private stakeholders, with local communities. The CIP is holistic – focusing on the nexus of water, land use, biodiversity and economic activities.

The objectives of the Catchment Investment Programme (CIP) include:

1. **To create a collective action platform, with a common vision, to address water security challenges in the Kruger to Canyons Biosphere Region.**
2. **To source and manage long-term financing solutions to implement Nature-based Solutions at scale.**
3. **To support existing initiatives and catalyse systemic change in catchment management.**

Nature-based Solutions are actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature. By clearing Invasive Alien Plants and introducing Grazing Best Management Practices, the threats driving water security and biodiversity loss will be controlled. In addition, a key focus will be on expanding and securing protected areas.

Controlling Invasive Alien Plants

Controlling invasive alien plants on 10,519 ha improves run-off, water infiltration and prevents water losses associated with invasive alien plant invaded catchments. In addition, terrestrial and freshwater biodiversity is protected, and ecosystem functioning is improved. The Invasive Alien Plant Clearing activity contains two phases: (1) An initial High Impact Phase involving intensive clearing in the short-term. (2) A Maintenance Phase follows to prevent regrowth in cleared areas.

Grazing Management

Restoring 10,559 ha of degraded grasslands through changing grazing practices addresses erosion, and reduces sedimentation, delivering benefits to 200 communal herders. This activity will increase the value of their livestock and improve their resilience to climate impacts through the restoration and maintenance of productive grasslands.

Area Protection

To secure the investment in nature, the CIP will seek to formally protect the areas where solutions are implemented. This maintains the impacts of the CIP's activities and secures the long-term success of the programme. This will see the protection of diverse ecosystems via biodiversity stewardship, driven by a landowner stewardship approach for protected areas expansion.

THE INVESTMENT CASE

This Business Case assessed the impact (costs and benefits) of implementing Nature-based Solutions in the Blyde River Catchment using a 6-step process.

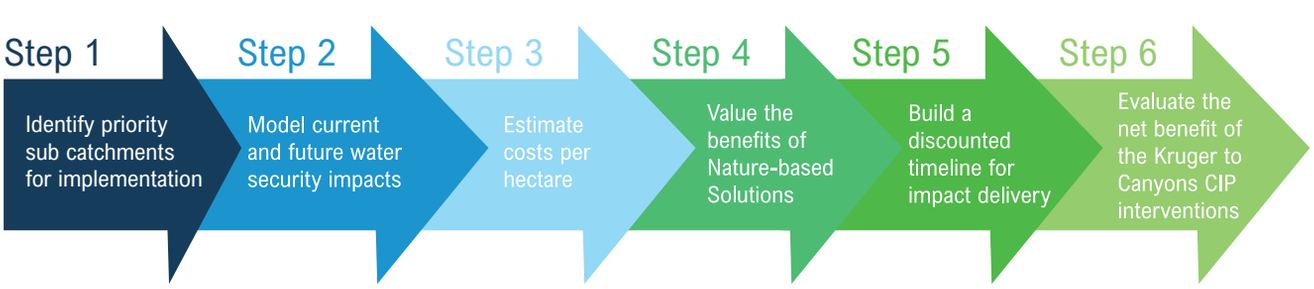


Fig 1 6-Step Impact Assessment Process

Over a 30-year period, results show that a lifetime investment of R254 million ($14.5 million) in Nature-based Solutions unlocks benefits worth R657 million ($37.7 million).[4]

The benefits are unlocked in several categories. The primary benefit is the delivery of 8.6 million litres of additional water per year. This equates to more than double the annual water demand of Hoedspruit town and contributes to protecting R605 million ($34.6 million) worth of agricultural yield in the mango and citrus farms downstream of the Blyderivierspoort Dam. This additional water also benefits large towns and industries further downstream, predominantly the Phalaborwa Mining Complex for whom this supplemental bulk water would be valued at R63.5 billion ($3.6 billion).[5] Other benefits include Poverty Alleviation worth R11.5 million ($650 000) in additional household income to upstream communities, the restoration of over 20,000 ha of biodiverse ecosystems, and over R40 million ($2.3 million) in carbon offset value. The financial and economic appraisal presented in this Business Case shows that, for every South African Rand invested in Nature-based Solutions, a return of more than R2.50 is generated. Cumulatively, the interventions create and protect almost 16,000 jobs.

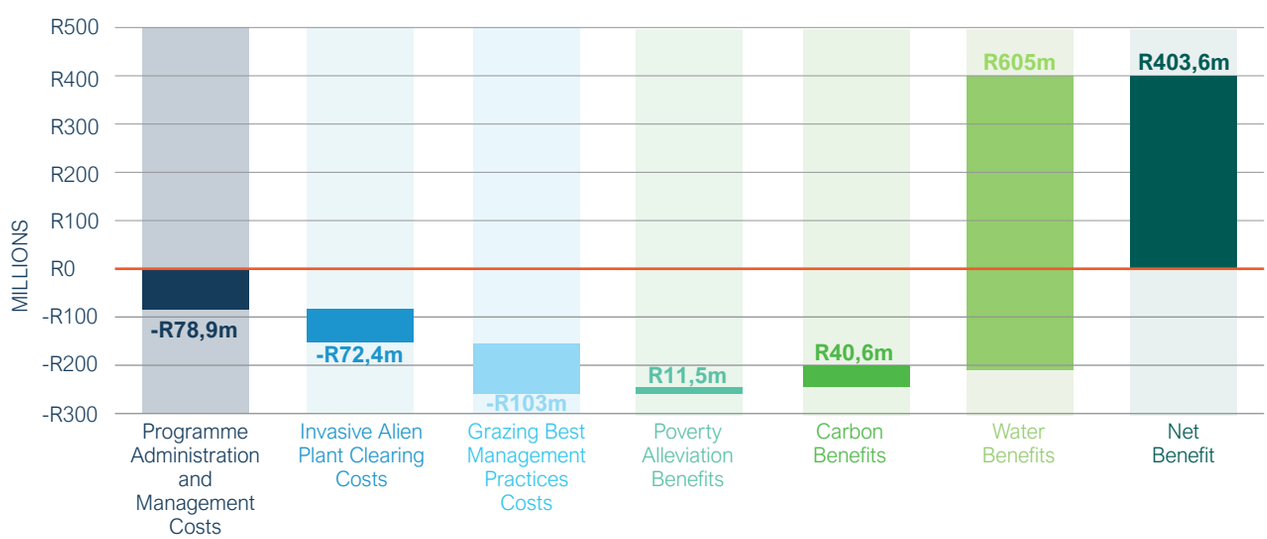


Fig 2 Lifetime costs and benefits of investing in nature-based solutions

WHAT IS NEEDED NOW

To realise all of these long-term benefits, the CIP will be established in two phases. In the first five years – the High-Impact Phase – the CIP requires R125 million ($7 million) in funding to initiate and scale-up Nature-based Solutions implementation. Over this period the CIP will also fully establish its governance arrangements and its long-term sustainable financing mechanisms. Seed capital provided for the High-Impact Phase will support the CIP's ability to prove its impact. This proof will catalyse longer-term support from a range of sustainable finance providers. The source of sustainable finance will be a blend of carbon credits, biodiversity compensation payments, and potential catchment levies. If the investment in the first phase is successful, this will enable a R260 million ($14.9 million) sustainably funded catchment restoration and conservation programme for the next 30 years.

[4] All figures are quoted in present value terms, discounted over 30 years at a social discount rate of 3.66%. Discount rates are used to put a present value on costs and benefits that will occur at a later date.

[5] This figure represents revenue from the sale of 8.6 Mm3 of water to industrial users (Phalaborwa Mining Complex) at a bulk water tariff of R7.38 per cubic metre.

01 Introduction

1. Introduction

In 2020, the Kruger 2 Canyons Biosphere, The Nature Conservancy and Conservation South Africa came together with the Nature for Water Facility to explore the feasibility of developing a Catchment Investment Programme (CIP) for the Biosphere Region.

The CIP is capitalizing on a globally proven governance and funding model that is typically called a Water Fund. Water Funds enable downstream water users – such as businesses, utilities and urban and agricultural users – to invest in upstream land management to improve water quality and quantity and generate long-term downstream benefits, such as biodiversity conservation, climate resilience, and improved livelihoods.

By bringing public and private stakeholders and communities together to create a shared vision for conservation, we can achieve more.

The CIP will serve as a long-term and inclusive collective action platform for convening diverse stakeholders in the landscape to collaborate effectively, mobilize resources for greater impact, and ensure continuity of investment. Initial efforts will focus on the Blyde River Catchment as a demonstration catchment.

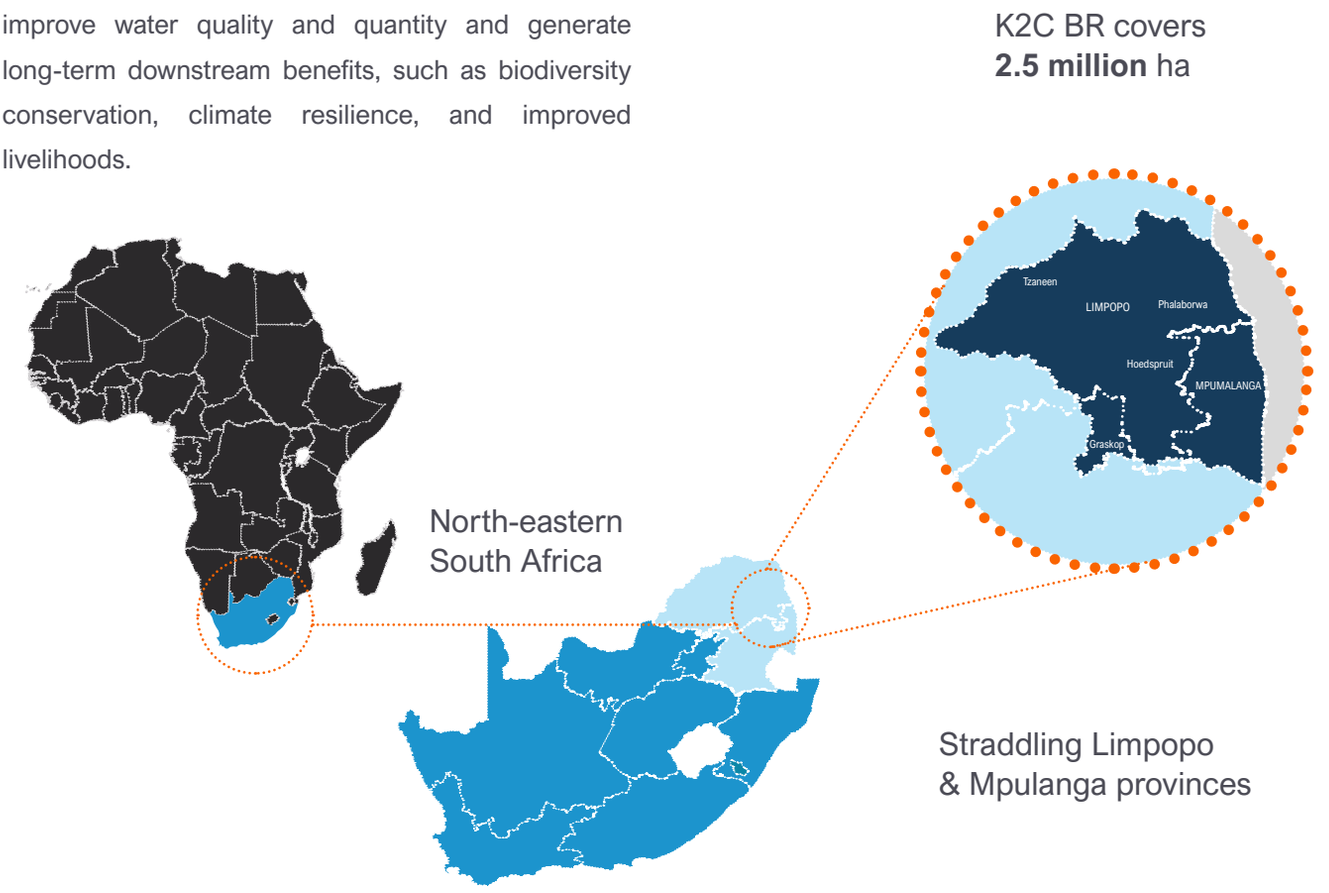


Fig 3 Location of the Kruger to Canyons Biosphere Region

1.1 Blyde River Catchment System

The Blyde River is an iconic landscape and cultural resource in South Africa, with its headwaters located in the Hartebeesvlakte Nature Reserve. The Blyde River Catchment spans various important ecosystems, with the river flowing through iconic landscapes, including the Blyde River Canyon and the Blyde River Canyon Nature Reserve, the latter of which also includes the Blyderivierspoort Dam.

Natural resource use within the catchment dates back to the stone and iron ages, with more recent activities including the gold rush during the late 1800's and early 1900's. Mining was located in and around Pilgrim's Rest, which saw miners panning for alluvial gold in the rivers and streams, before technology advances took mining underground. This resulted in the start of the forestry industry to provide timber for mining struts.

Blyde River Catchment:

Mean Annual Runoff: *385.7 million m3*

Size of the sub-catchment: *2 000 km2*

Total length of Blyde River: *>135 km*

Drop in elevation: *ca. 1 600 metres*

The upper reaches of the river are located within the Mpumalanga Drakensberg **Strategic Water Source Area** for South Africa. These areas provide numerous important ecosystem services to downstream areas and must be protected for current and future generations. Key ecosystem services include flood attenuation, water purification, erosion control, water provision and habitat for species. These essential ecosystem services are currently under threat.

Without large-scale nature-based interventions, we can expect to see increasing land degradation, leading to increased sediment loads, reduced resiliency for the catchment to cope with extreme events (floods, droughts, fire, etc.), loss of biodiversity and key habitats, continued spread of invasive alien plants, and a reduction in livelihoods reliant on the landscape, all of which impact on water security and regional stability. Degradation in the upper catchment will have a direct impact on downstream water users, through reduced reliability of water supply (quantity) and quality. The saying that "prevention is better than cure" strongly applies to catchment management.

In addition to serving direct downstream users, the Blyde River serves as a lifeline to the Olifants River, supporting water users further downstream including the town of Phalaborwa and multiple surrounding industrial and mining areas. The Olifants River also forms part of a transnational catchment in South Africa and Mozambique, supporting >5 million people. The Olifants River is significantly contaminated from upstream activities, such as mining and agriculture, but the provision of 400 million m^3 of good quality water annually from the Blyde River helps to dilute the pollutants. This ensures that the water quality remains acceptable for users downstream of the confluence, such as tourism and wildlife within the Kruger National Park.

Strategic Water Source Areas are those that supply a disproportionate amount of mean annual runoff to a geographical region of interest. *In South Africa only* ***8% of the land area produces the runoff*** *(water that drains from the surface of an area of land into the river systems) that* ***generates 50% of the volume of water*** *in our river systems.*

1.2 Blyde River Catchment System

The Blyde River is an iconic landscape and cultural resource in South Africa, with its headwaters located in the Hartebeesvlakte Nature Reserve. The Blyde River Catchment spans various important ecosystems, with the river flowing through iconic landscapes, including the Blyde River Canyon and the Blyde River Canyon Nature Reserve, the latter of which also includes the Blyderivierspoort Dam.

Natural resource use within the catchment dates back to the stone and iron ages, with more recent activities including the gold rush during the late 1800's and early 1900's. Mining was located in and around Pilgrim's Rest, which saw miners panning for alluvial gold in the rivers and streams, before technology advances took mining underground. This resulted in the start of the forestry industry to provide timber for mining struts.

Table 1 - Land-use drivers threatening water security in the Blyde River Catchment.

Land-use management drivers	Threats	Impacts
Resource constraints affecting historical state-owned forestry areas	• Spread of invasive alien plants	• Water quantity and quality are reduced • Indigenous biodiversity is crowded out
Mining	• Loss of biodiversity • Heavy metal pollutants • Sedimentation	• Poor water quality • Reduced health of aquatic ecosystems • Increased water treatment costs
Unsustainable farming practices, such as monoculture, excessive fertilization and over-tilling	• Increased run-off leading to erosion, nutrient leaching and sedimentation • Pollution from chemicals • Reduced infiltration	• Poor water quality • Reduced groundwater recharge • Threat to Blyderivierspoort Dam's storage capacity • Biodiversity loss and reduced health of aquatic ecosystems • Increased water treatment costs
Overgrazing	• Increased run-off leading to erosion and sedimentation • Reduced infiltration	
Too frequent burning and poor burning practices	• Loss of biodiversity • Increased run-off and erosion	• Increased erosion – poor water quality • Threat to Blyderivierspoort Dam's storage capacity
Land-use change (e.g. urban sprawl) and encroachment into natural areas	• Loss of indigenous ecosystems	• Loss of biodiversity and ecosystem services

While invasive alien plants are a problem throughout the landscape, the most significant impacts are felt in the escarpment and upper catchment, with invasive alien plants being one of the greatest threats to the Strategic Water Source Area and to biodiversity. Invasive alien plants are more resilient and spread quicker than local indigenous species, taking over large expanses, and requiring much more water than local species. Invasive alien plants consume around 7% of South Africa's total surface water resources; water which should end up in our rivers and dams.[6] If left to spread unchecked, invasive alien plants could consume up to 60% of our water, meaning ongoing clearing of these species from our catchments is critical. The main culprits include pine, black wattle and eucalyptus species, which have largely spilled over from forestry practices, and which all have a significant impact on water flow and water quantity.

Nature-based Solutions are actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature.[7]

Nature-based Solutions are underpinned by benefits that flow from healthy ecosystems and they target major challenges like climate change, disaster risk reduction, food and water security, biodiversity loss and human health, and are critical to sustainable economic development.[7]

Nature-based Solutions, such as controlling Invasive Alien Plants and Grazing Best Management Practices, are being targeted to address threats and mitigate impacts. **These solutions also have several positive co-benefits, including carbon sequestration and the creation of sustainable employment opportunities.** They provide a demonstration of what can be achieved when investing in nature.

1.3 Current initiatives

Several initiatives and programmes are being implemented in the Blyde River and neighbouring catchments, focusing broadly on restoration activities. Various pilot projects have been trialled, based on the local context, and show proof of concept. Through these initiatives, a strong partnership network exists in the landscape and while there have been localised successes, a number of challenges impact on the effectiveness and ability to see long-term restoration gains. Challenges typically include:

- the duration of programmes, which tend to be too short to realise significant benefits,
- disparity in where to implement for maximum impact,
- limited funding for training,
- lack of an integrated approach to restoration, and
- on-the-ground implementation challenges leading to ineffective project outcomes.

While challenges exist, efforts over the last ten years have seen the restoration of 30,000 ha of important habitats within the Kruger National Park buffers, and more recently within the escarpment, co-ordinated by the Blyde Restoration Working Group. A total of 20,000 ha of additional land has also been incorporated into the reserve, working through local communities. A comprehensive restoration plan for the Blyde River Canyon Nature Reserve has been produced to guide efforts, although it does not cover the entire catchment, which is seen as a limitation.

Other efforts include a successful 2017 grazing pilot project which supported communal farmers in grazing stewardship and climate-smart livestock production, which is now being rolled out to other communities, and the establishment of a working group to identify future opportunities in the informal economy linked to woody biomass (removed during clearing), laying the groundwork to explore value-adds to invasive alien plant clearing activities.

Despite efforts from several committed partners, catchment-wide impacts haven't been realised. Sustainable financing, collective action and a long-term strategy are now needed to upscale these initiatives.

1.4 Collective action for water security

The Blyde River catchment is a complex and ecologically and socio-economically diverse area facing multiple threats from alien plant invasions, illegal mining and land-use changes from natural to degraded. Upstream unsustainable land-use activities, variability in climate conditions, and increasing water demand from population growth and economic activities all negatively compound on the Blyde River Catchment's ability to provide critical source water. This directly impacts critical natural assets, such as water and biodiversity, it causes economic uncertainty and financial losses, and it limits peoples' ability to adapt to ever-changing climatic conditions. This is a complex challenge which has been decades in the making; addressing it requires a collective approach that is holistic – focusing on the nexus of water, land-use, biodiversity and economic activities.

The Blyde system includes multiple water and ecosystem users made up of private and public sectors and local communities in the catchment. These include multiple government departments at national, provincial, and municipal levels, mining and forestry companies, as well as local communities up and downstream. Whilst there have been several catchment management interventions implemented over many years, the wide range of stakeholders has added to the complexity of finding solutions and aligning on a long-term strategy.

It is against this backdrop that a new approach through the Kruger to Canyons CIP is needed. It is a partnership bringing upstream communities, public, private sector and downstream users together — around the common vision of restoring the catchment and aquifers that supply water and ecosystem services to so many. The CIP has three primary purposes:

1. **To create a collective action platform, with a common vision, to address water security challenges in the Kruger to Canyons Biosphere Region.**
2. **To source and manage long-term financing solutions to implement Nature-based Solutions (NbS) at scale.**
3. **To support existing initiatives and catalyse systemic change in catchment management.**

So, the CIP establishes a collective action platform, working towards a common vision for water security in the catchment, that is underpinned by sustainable financing. This approach builds on The Nature Conservancy's experience in +40 established Water Funds, across the globe. It is planning to be the second of its kind in South Africa, after the Greater Cape Town Water Fund.

This Business Case for the Kruger to Canyons CIP was developed under the auspices of the Management Committee (MANCO), in consultation with key government stakeholders including the SANBI Living Catchments Project. Kruger to Canyons Biosphere Region NPC will act as the secretariat for the CIP, with support from The Nature Conservancy and Conservation South Africa. The K2C CIP MANCO includes representatives from the private sector, participating non-government organisations, as well as CIP beneficiaries.

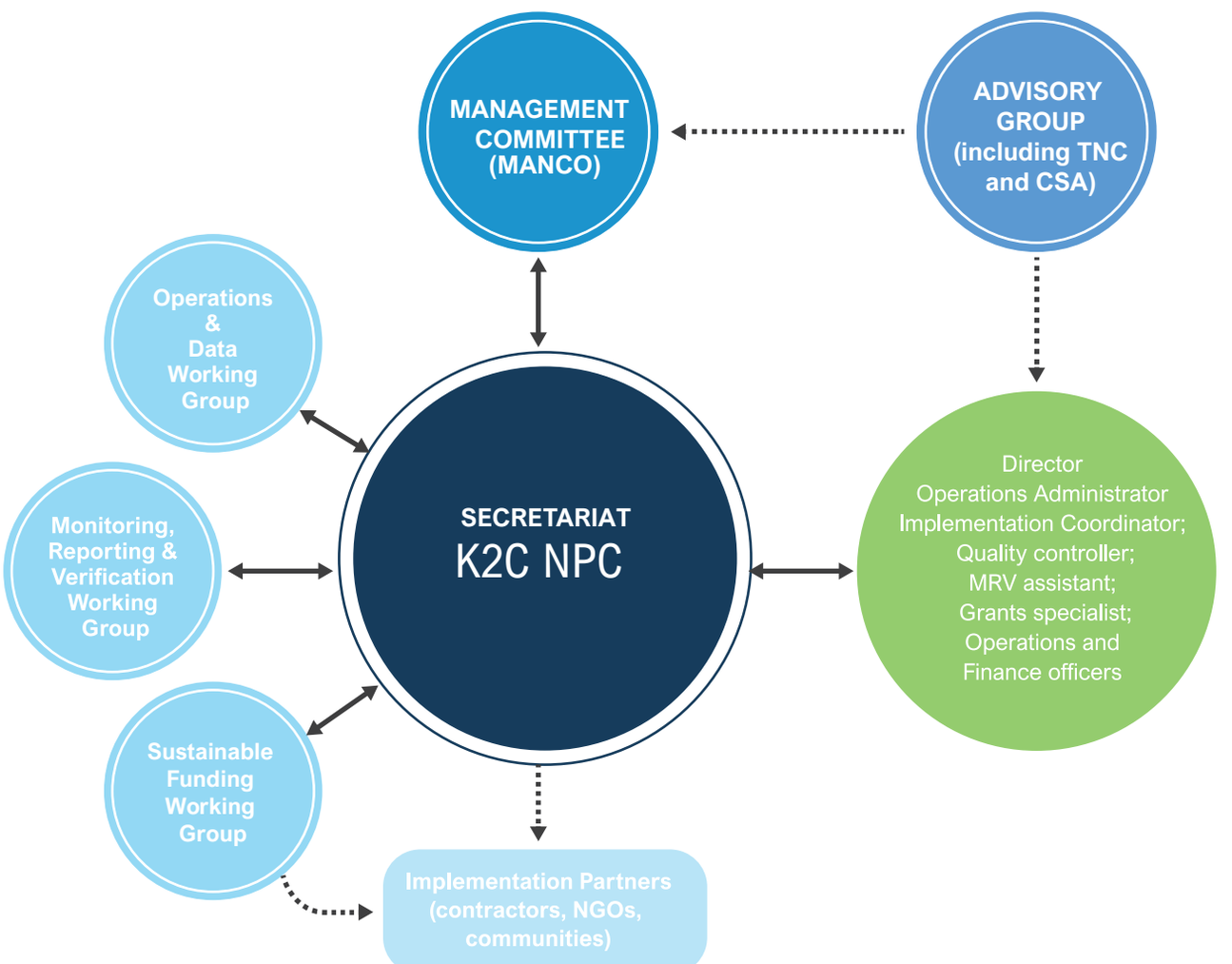
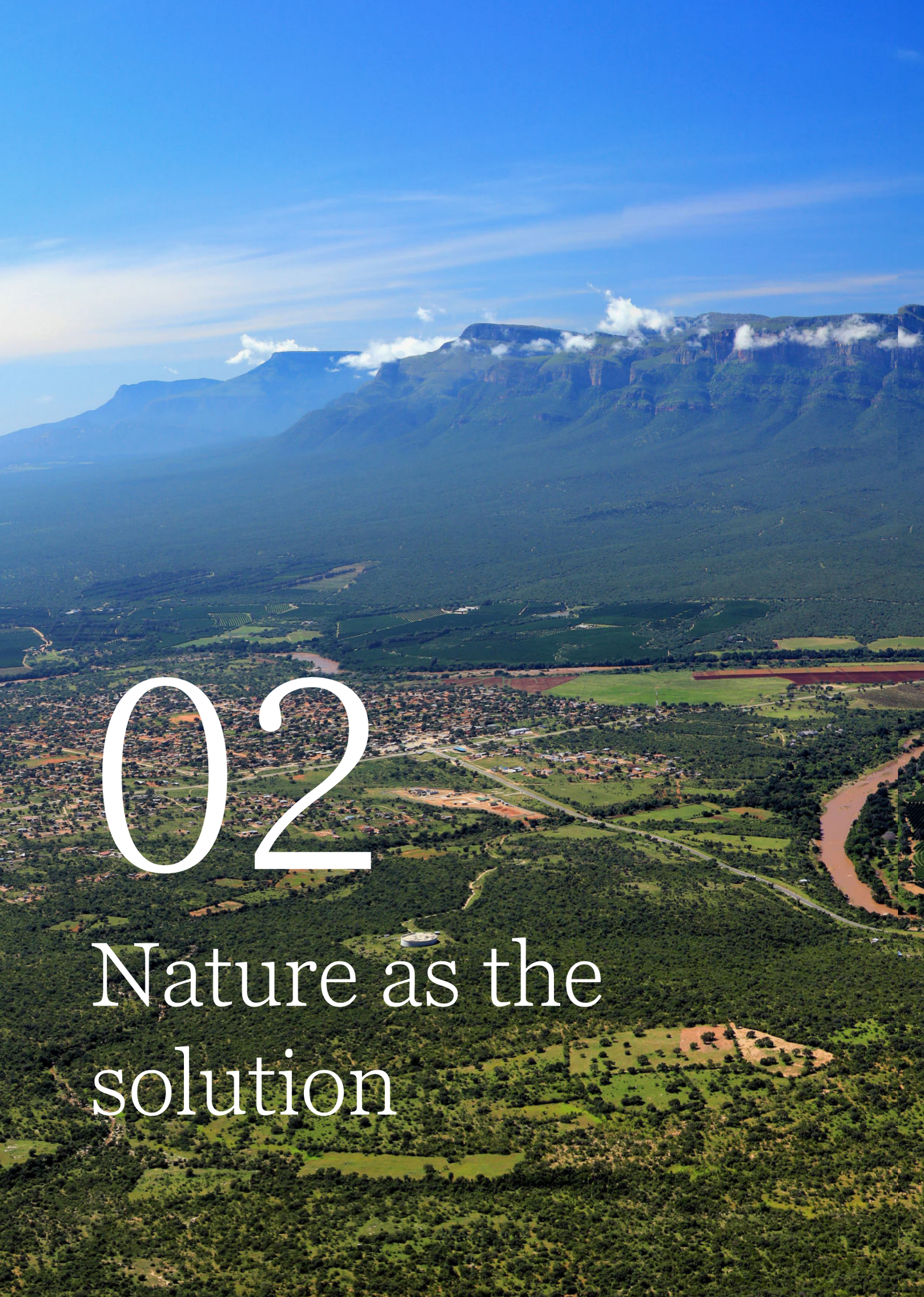


Fig 4 Interim Governance Structure for the Kruger to Canyons CIP



02

Nature as the solution

2. Nature as the solution

This Business Case has identified the threats within the upper catchment and prioritised the Nature-based Solutions that can contribute to addressing some of the threats affecting the Blyde River Catchment, in order to maintain the quality and quantity of water supplied by the system, while enhancing biodiversity. Two priority interventions were identified through a participatory approach, including interviews and engagements with key stakeholders.

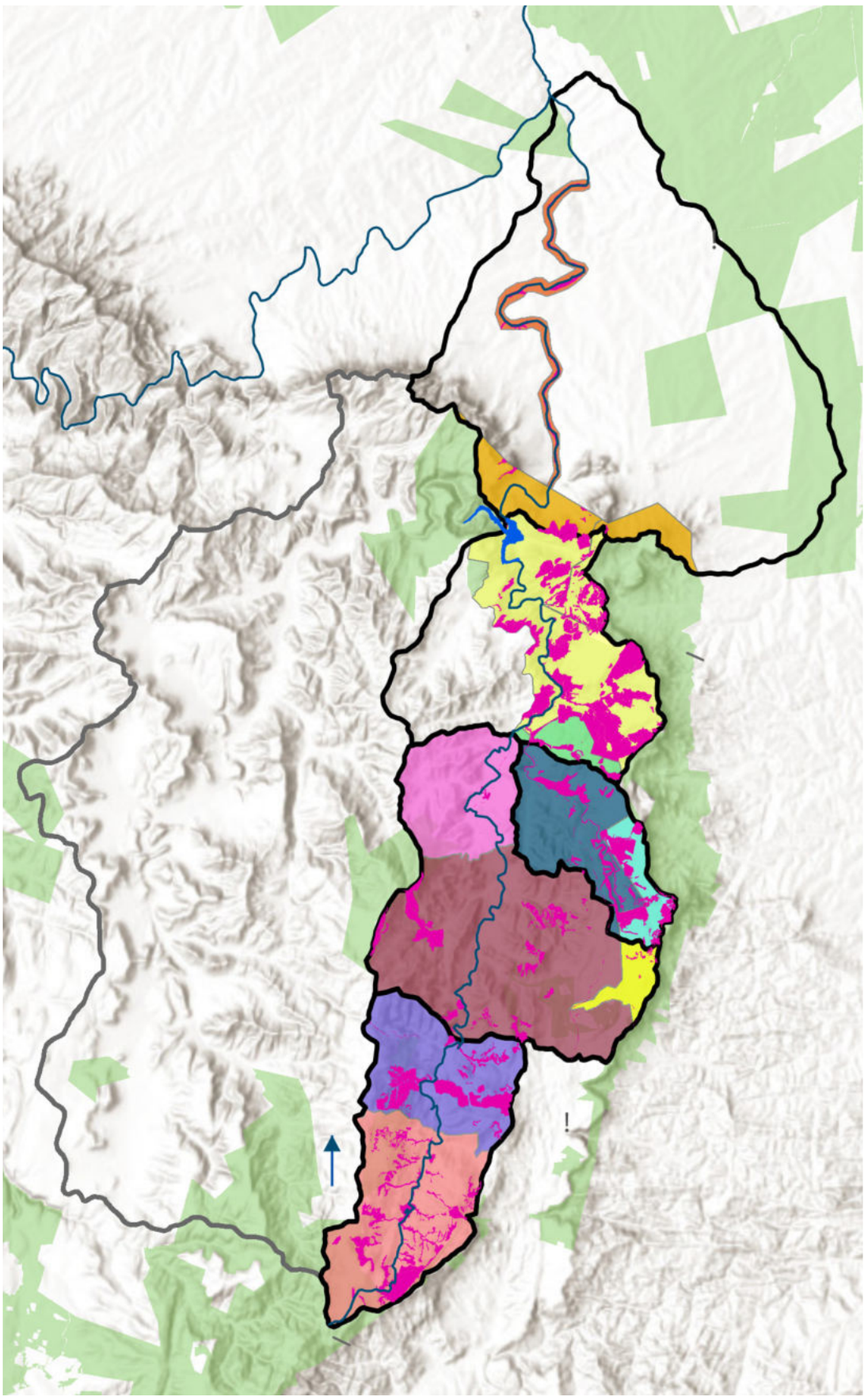


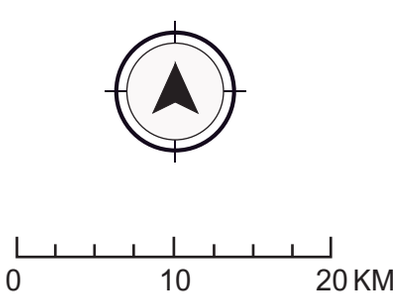
Fig 5 Implementation areas for Invasive Alien Plant Clearing

Legend

- IAP Areas
- IAP Areas
- IAP Areas
- Blyde River Catchment
- Blyde Quarternary Catchment
- Protected Areas
- Blyderivierspoort Dam

Management Unit

- BLY01
- BLY02
- BLY03
- BLY04
- BLY05
- BLY06
- BLY07
- BLYNR08
- BLYNR09
- BLYNR10
- BLYNR11



2.1 Invasive Alien Plant Clearing

Invasive Alien Plant Clearing will target 10,519 ha of the Blyde Catchment area (7% of the total 155,489 ha) that is invaded mainly by pine and eucalyptus species. To plan for the implementation of clearing activities, management units have been designated with the control of invasive alien plants containing two phases:

1. An initial High Impact Phase involving intensive clearing in the short-term.
2. A Maintenance Phase to follow, preventing regrowth in cleared areas.

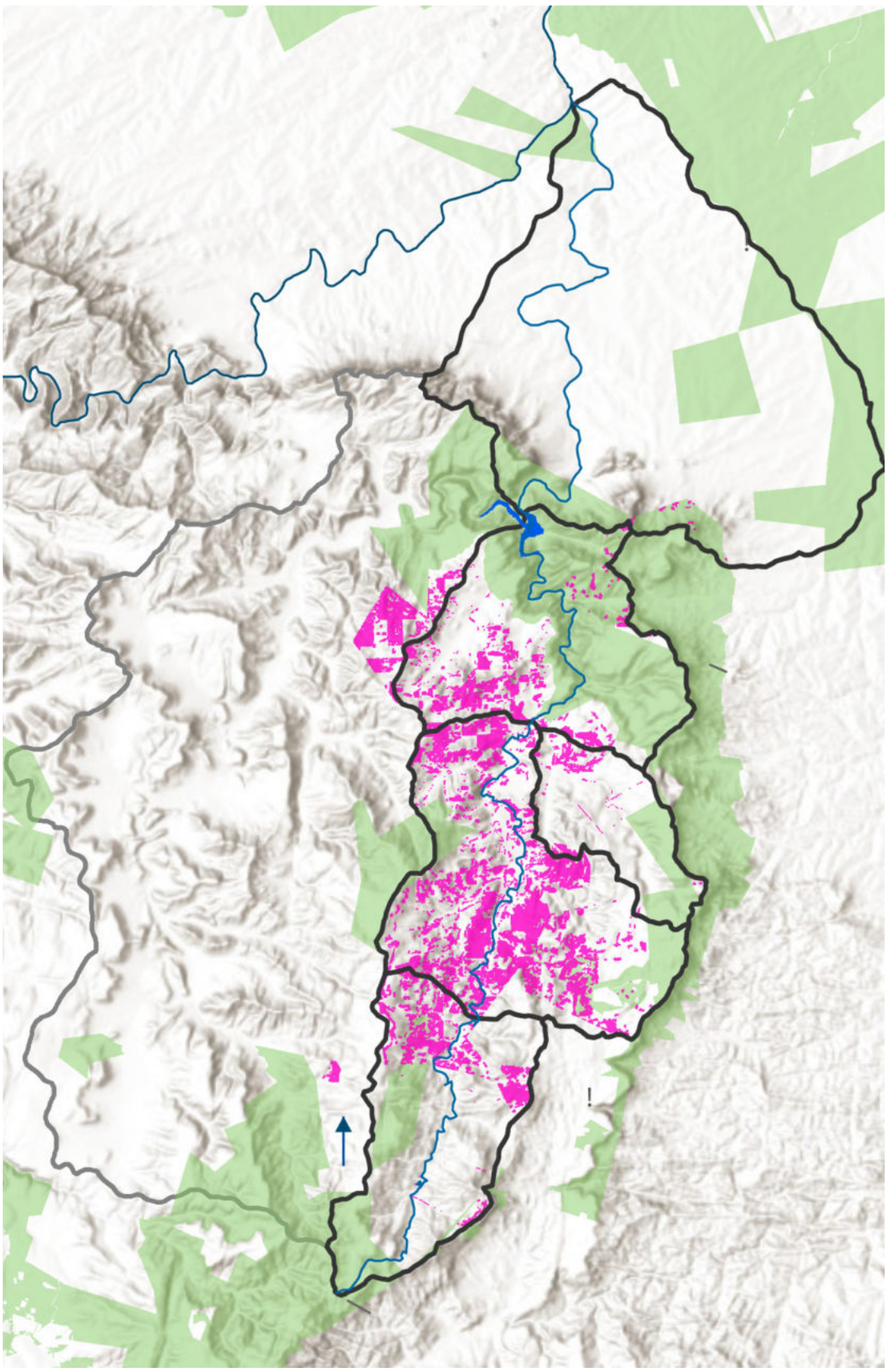
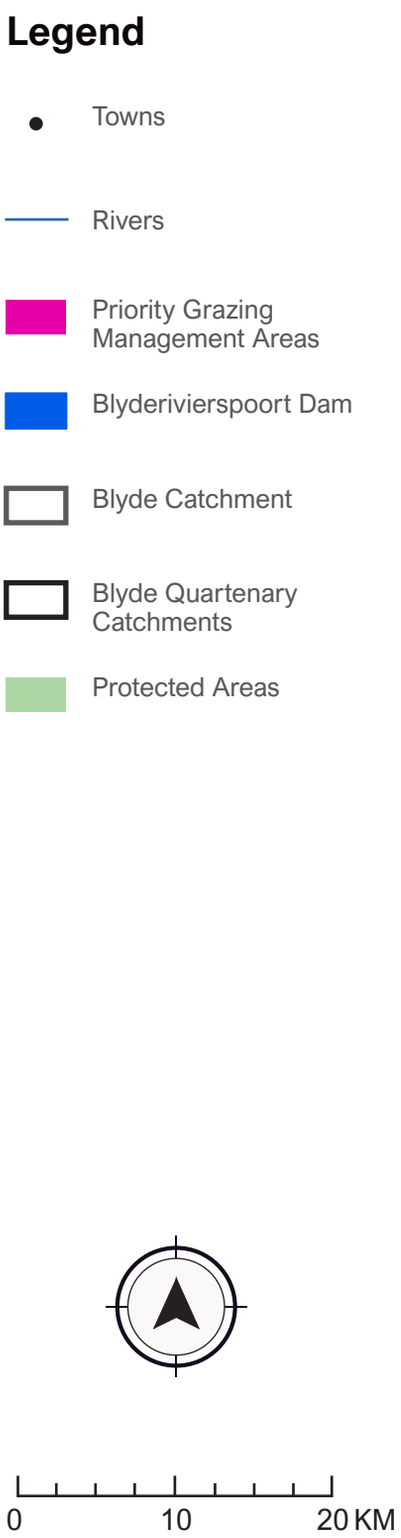


Fig 6 Implementation areas for Grazing Best Management Practices

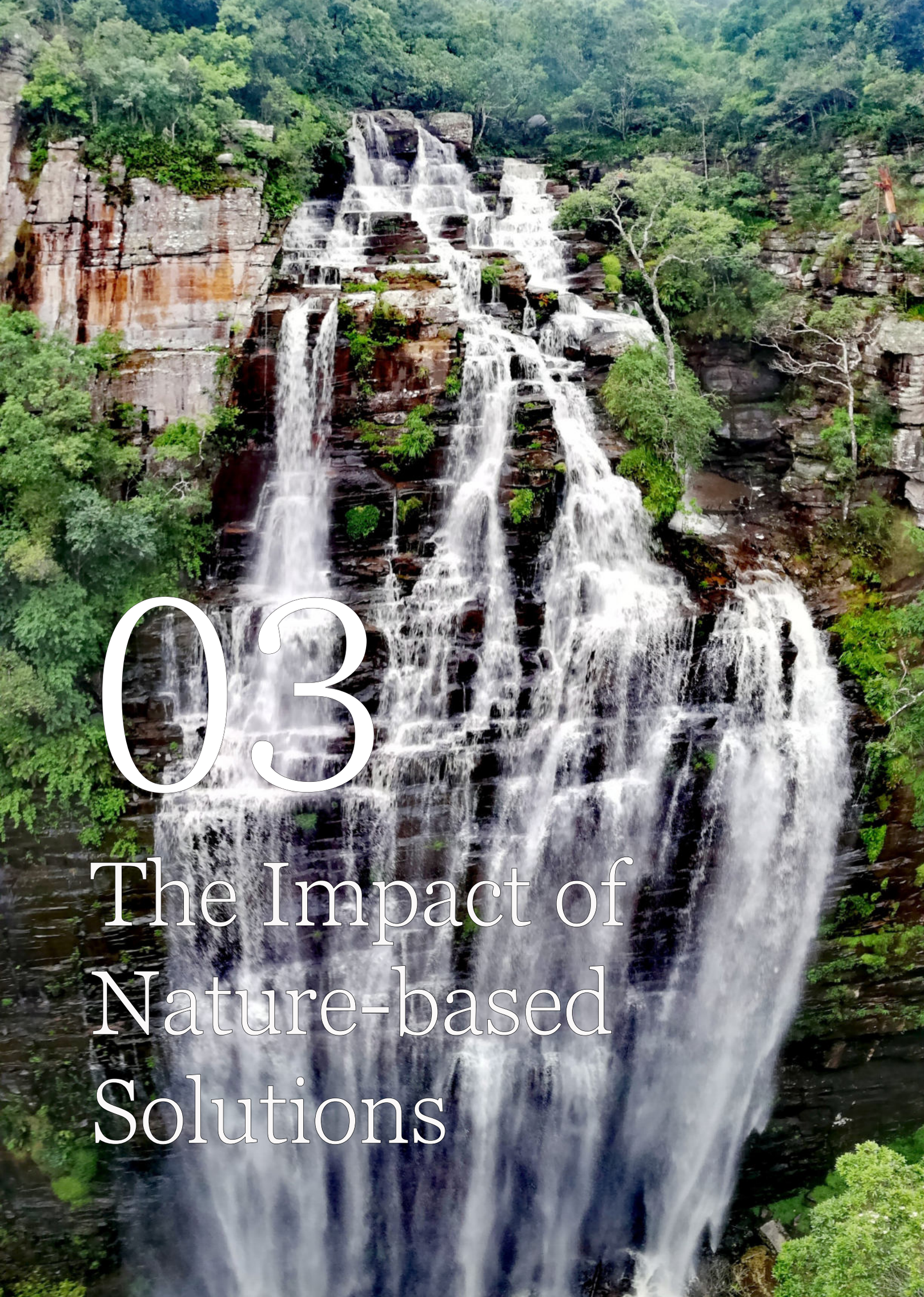
2.2 Grazing Best Management Practices



Grazing Best Management Practices will take place predominantly on land owned by Communal Property Associations. Grazing management involves the co-development of grazing management solutions to address issues of overgrazing. It includes evidence-based practices for improved animal and ecosystem health outcomes. Over-grazing results in a loss of vegetation cover, leading to ground compaction and a deterioration in the biodiversity value of the land, as well as increased erosion rates. This has a direct impact on the health of cattle, which in turn reduces the livelihood opportunities for communal farmers.

Community engagement and knowledge sharing plays a crucial role in this Nature-based Solutions intervention. Eco-rangers from beneficiary communities will be trained to work with communal farmers and monitor implementation. The primary incentive for uptake is facilitating improved access to livestock markets through mobile auctions, access to livestock medicine and services like sheep shearing.

The grazing management activities will take place on 10,559 ha of degraded grasslands in the upper areas of the Blyde River Catchment, restoring these areas to reduce erosion and improve biodiversity value. This activity will target roughly 200 communal herders, increasing the value of their livestock and improving their resilience to climate impacts in the Blyde Catchment.



03

The Impact of Nature-based Solutions

3. The Impact of Nature-based Solutions

The development of the Kruger to Canyons CIP is informed by a detailed feasibility study. This Business Case highlights an outline of the robust approaches taken for these studies, as well as the headline results.

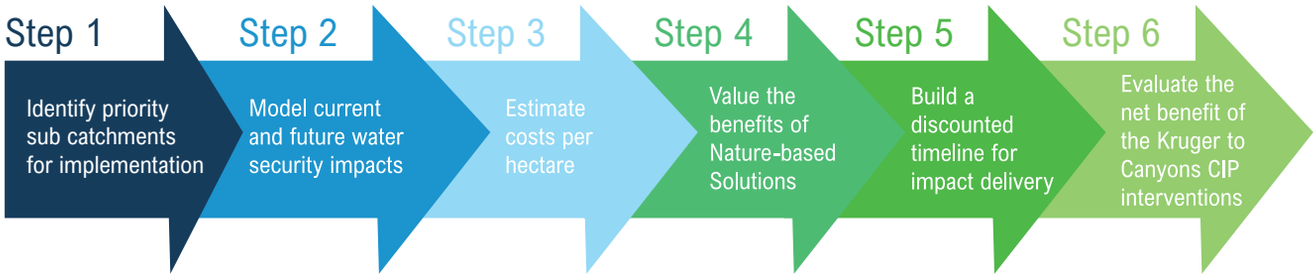


Fig 7 6-Step Impact Assessment Process

STEP 1 Identifying priority sub-catchments for implementation

Extensive stakeholder engagement, as well as a detailed pre-feasibility study, identified the key factors contributing to sub-catchment degradation to be invasion of alien plants and over-grazing. Following this, Invasive Alien Plant Clearing and Grazing Best Management Practices were prioritised as the CIP's key activities. Step 1 used this information to identify priority sub-catchments for initial implementation.

A spatial analysis revealed widespread invasive alien plant infestation across the Blyde River Catchment area, with 10,519 ha (7%) densely invaded.

Upstream of the Blyderivierspoort Dam, clearing of 8,964 ha was identified to estimate the reduction in water yield losses due to unmanaged invasive alien plants. Downstream, the clearing of 1,555 ha of infested riparian land was identified to estimate streamflow improvements to water users in Hoedspruit town and beyond.

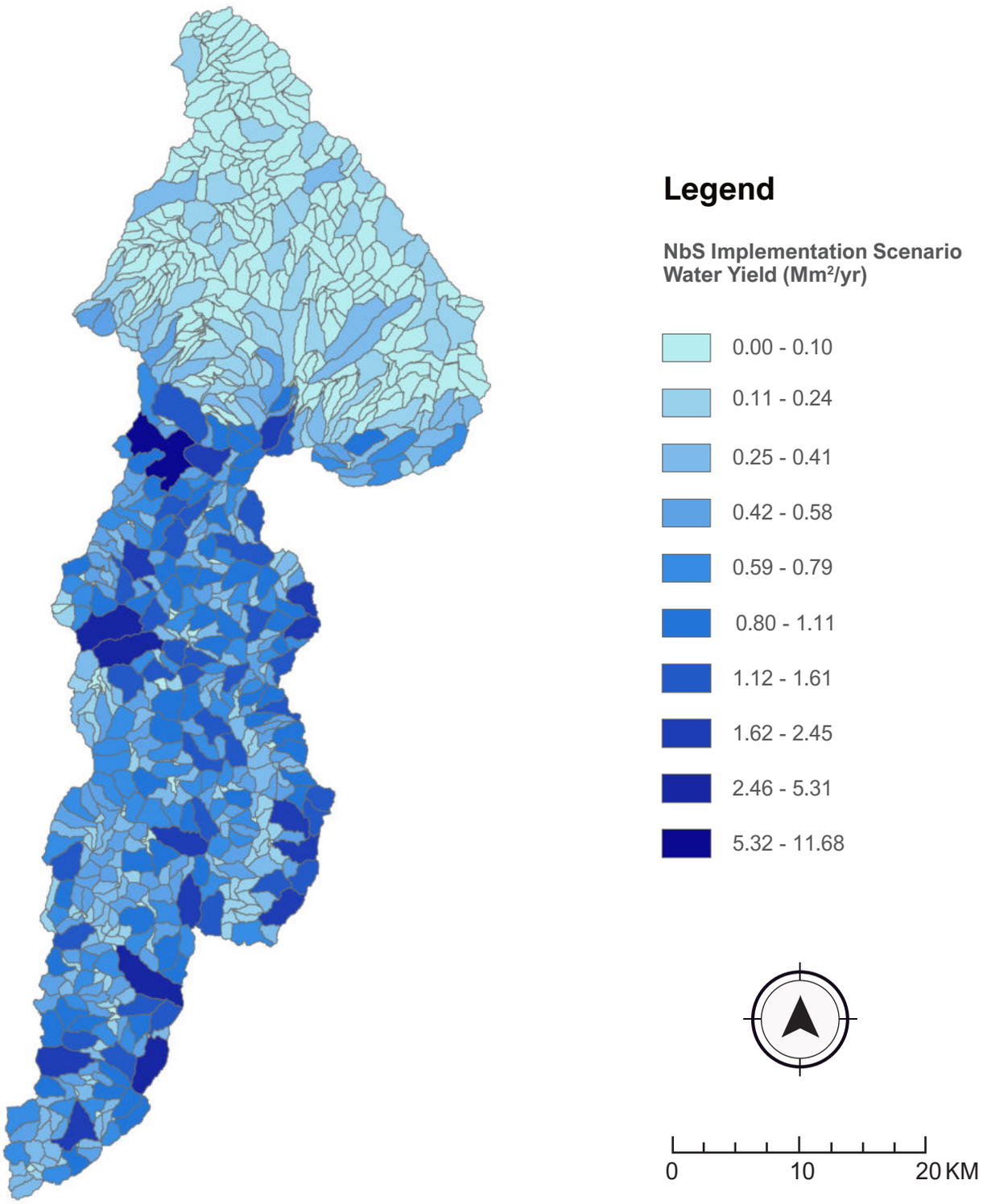


Fig 8 Priority sub-catchments for Invasive Alien Plant Clearing based on highest water yield

Over-grazing is a challenge throughout the upper catchment. An area of 10,559 ha of grassland was identified for restoration by engaging communal farmers. Grazing Best Management Practices will be implemented through an incentives-based approach that offers improved access to markets and livestock management support by eco-rangers.

STEP 2

Modelling current and future water security impacts

The Soil and Water Assessment Tool[8] (SWAT) was used to simulate the current and potential future water security impacts of invasive alien plants in the Blyde River Catchment. SWAT is a process-based catchment scale hydrological model. The hydrologic processes simulated by SWAT include evapotranspiration, canopy storage, surface runoff, soil infiltration, lateral water flow, groundwater recharge, baseflow, etc.[9] SWAT is also able to represent water reticulation, pond storages, reservoir operations and irrigation practices.

The current water security impacts of invasive alien plants were estimated through a two-step process:

- Completing a baseline simulation of the Blyde River Catchment, which accurately considers the current catchment physical properties, including the occurrence of invasive alien plants.
- Completing a scenario simulation of the Blyde River Catchment, which considers the removal of all invasive alien plants and subsequent restoration of indigenous grasslands.

This process estimated that the removal of invasive alien plants across 8,964 ha in the areas upstream of Blyderivierspoort Dam would reclaim the loss of 8.6 million cubic metres of water per year. The impact of this additional water yield is greater stability and reliability of supply from the Blyderivierspoort Dam. This amount of water equates to more than double the annual water demand of Hoedspruit town and contributes significantly to the water security of users further downstream (in Phalaborwa and beyond) who rely on the Blyde River's supply of water into the Olifants system.

This two-step process was also followed to estimate the future water security impacts of invasive alien plants. It was assumed that the historic and near-term future climate characteristics would be similar and therefore a subset of historic climate input data was used as a proxy for the near time future climate input data. The results of the simulation showed that the removal of invasive alien plants would continue to have a positive impact on water security in the future.

Observation of the response of the Blyderivierspoort Dam in particular, showed that the removal of invasive alien plants provides a buffer during times when the reservoir level significantly reduces. That has particular relevance for the irrigated agriculture sector in the Blyde River Catchment, whose supply is restricted to prioritise domestic water supply and allocations to the Olifants River system.

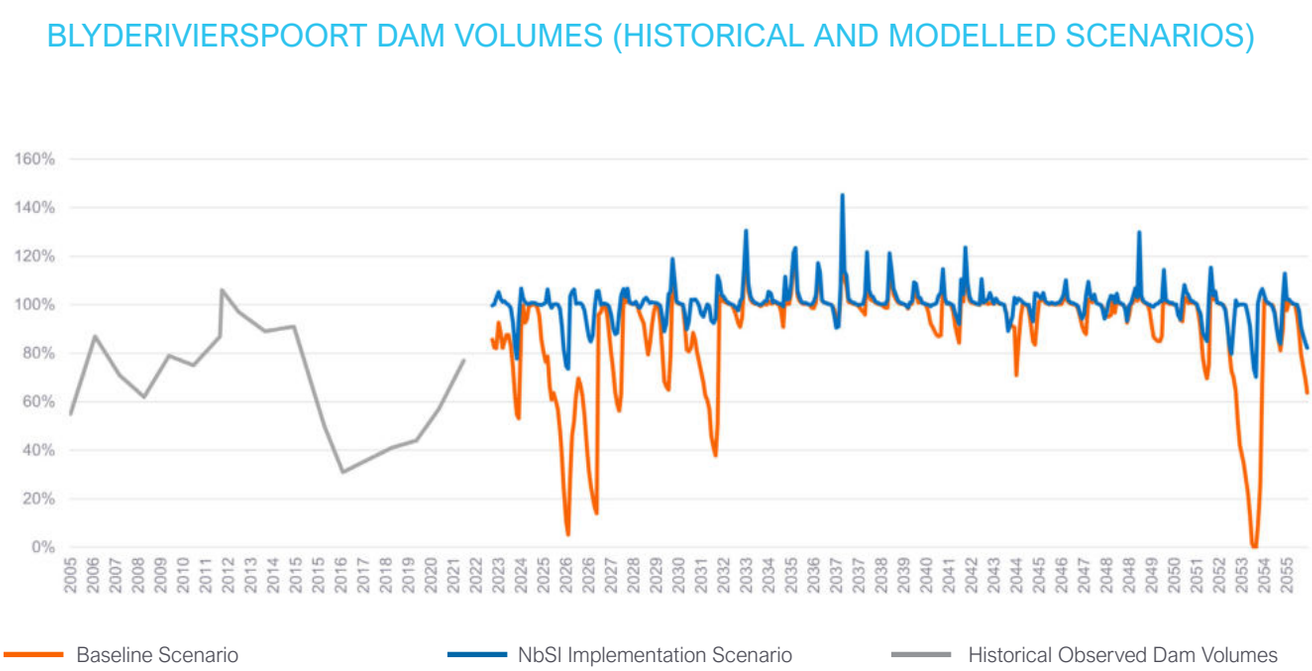


Fig 9 Blyderivierspoort Dam Volumes (observed historical record and modelled scenarios)

STEP 3

Estimating the costs per hectare of Invasive Alien Plant Clearing and Grazing Best Management Practices based on local conditions

The cost to control invasives and maintain cleared areas in the priority sub-catchments over 30 years is determined by considering the average density of invasive alien plant species in the catchment area and species typology along with the average person days (PD) required to clear the given level of infestation. Person day costs are based on both local and international expert experience in Invasive Alien Plant Clearing. Current[10] per person costs were used as a baseline and expressed in Rands or USD[11] per person day (R/PD or $/PD).

The model accounts for the fact that Invasive Alien Plant Clearing is not a once-off intervention but requires regular management of the catchment to ensure long-term outcomes are achieved. The model therefore accommodates three clearing phases, initial clearing, follow-up, and maintenance. Initial clearing activities are expected to last one year per management unit, with completion of all management units in the first three years (Year 1 - Year 4). Maintenance per management unit will take place as soon as initial clearing has been completed, and last one year per unit, with expected completion over a four-year period (Year 2 - Year 6). Follow-up activities will then be carried out for the remining 28 years (Year 3 - Year 30).

[10] Costs as per the 2023 calendar year.
[11] Exchange rate of ZAR 17,45 to USD 1 was used based off the forecast average annual exchange rate as determined in March 2023.

The High Impact Phase requires higher upfront costs in the first five years of the programme. These costs are estimated to reduce over time as the programme enters the Maintenance Phase. This is commensurate to expenditure patterns seen in other clearing programmes.

Invasive Alien Plant Clearing costs are expected to range from R6 415 ($367) per hectare during the High Impact phase to R938 ($54) per hectare during the maintenance phase.

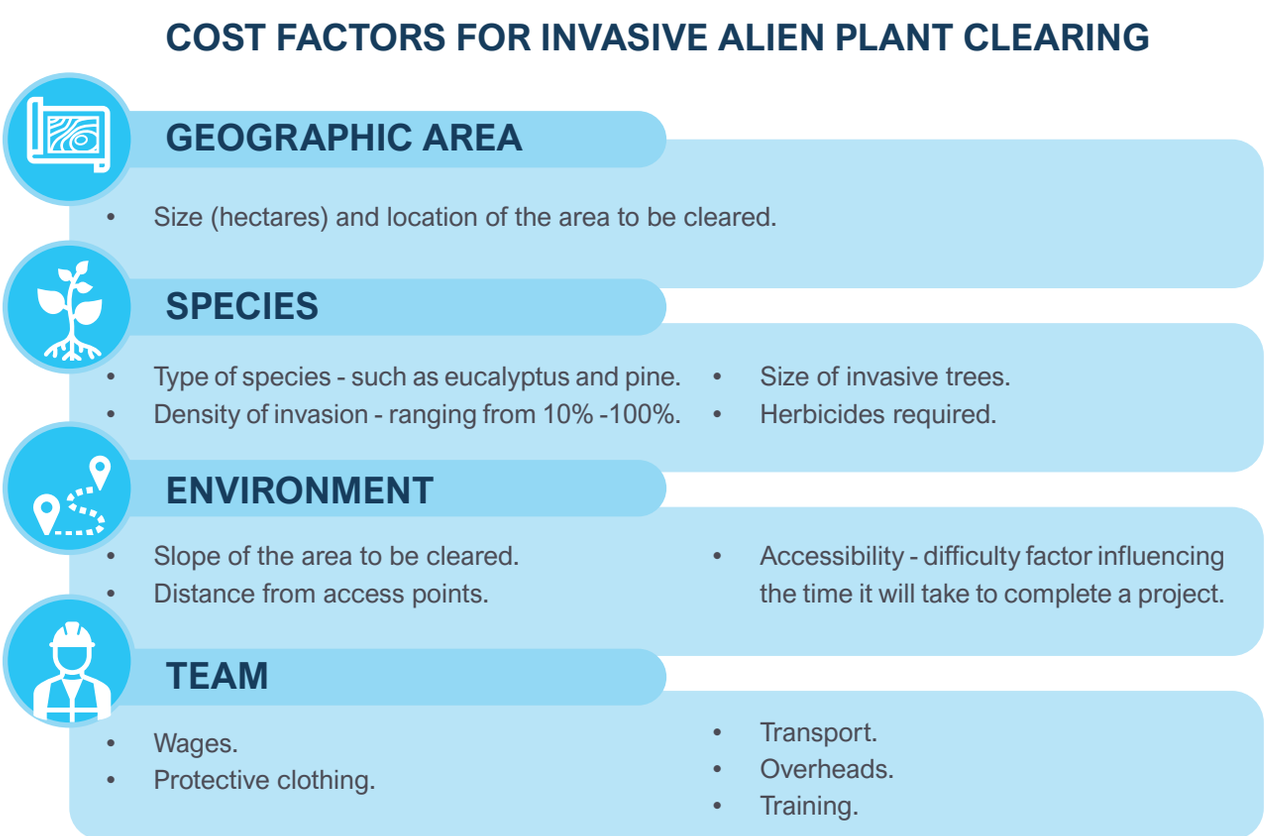


Fig 10 Cost factors for Invasive Alien Plant Clearing

Grazing best management costs are driven by the maximum number of cattle the allocated grazing area can accommodate. In the case of the CIP, the 10,559 ha of protected grazing is expected to sustainably accommodate 2,640[12] head of cattle per annum, with this number remaining consistent throughout the programme. The number of cattle required to be managed drives the intervention's equipment, supplies, monitoring and evaluation, human resource and associated costs, such as training and uniforms. The programme will train and employ 26 eco-rangers a year, providing 780 employment opportunities over the lifetime of the CIP.

[10] Costs as per the 2023 calendar year.
[11] Exchange rate of ZAR 17,45 to USD 1 was used based off the forecast average annual exchange rate as determined in March 2023.

In total, the cost of Grazing Best Management Practices is expected to be R5.6 million ($320 000 USD) per annum. Grazing Best Management Practices expenditure was determined using current[11] costs as a baseline expressed in Rands and USD[12].

Costs associated with Grazing Best Management Practices are estimated to reach a maximum of R566 ($32 USD) per hectare per annum.

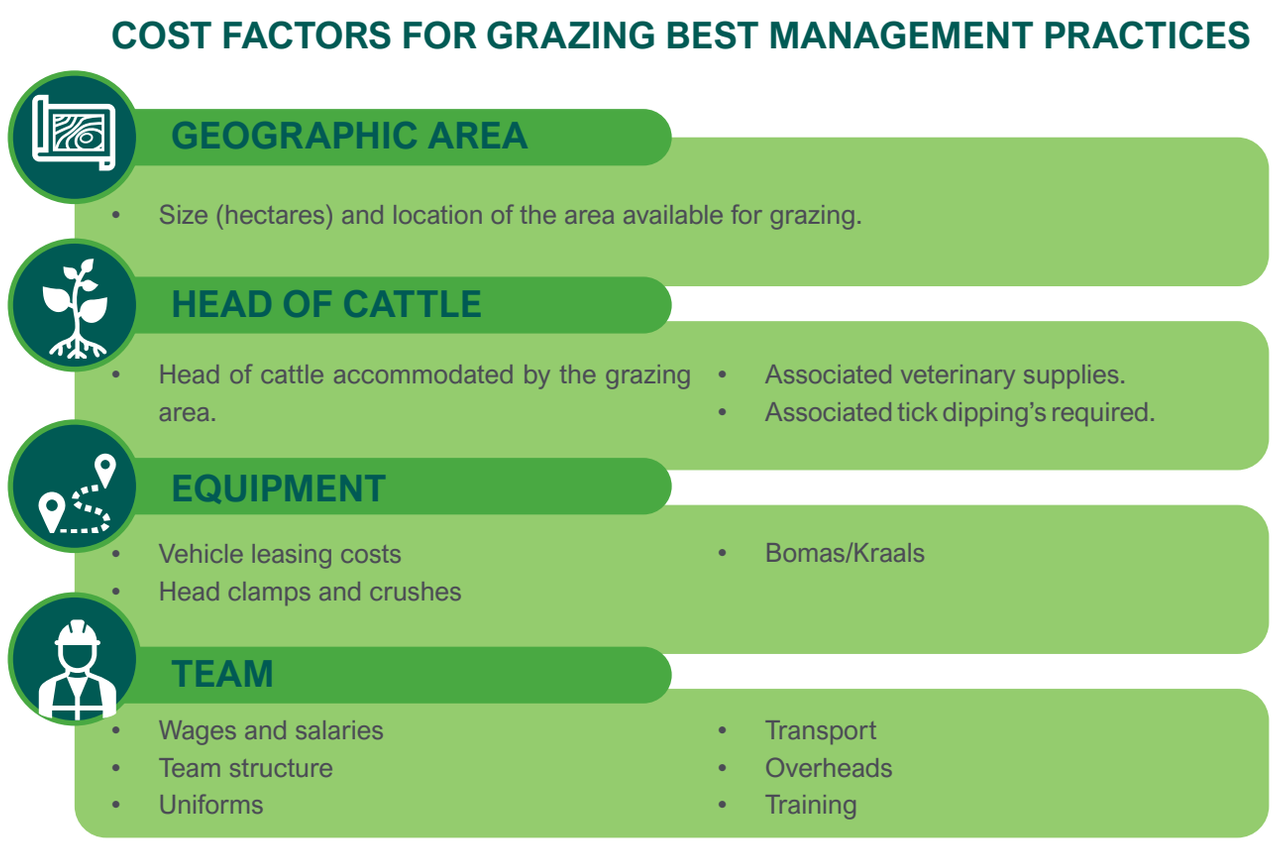


Fig 11 Cost factors for Invasive Alien Plant Clearing

Overall CIP programme management costs are shared across the two Nature-based Solutions, allowing for sharing of resources and reducing costs. Typical programme costs include back-office functions and staff, programme oversight, travel, rental expenses, and overheads. Total management (non-programme) costs account for 17% of total costs.

Overall programme management and implementation costs are expected to be R4.7 million ($250 000) per annum and remain constant throughout the programme

[12] Best practice indicates 0,25 heads of cattle per hectare.

STEP 4

Valuing the benefits of implementing Nature-based Solutions

There are four broad benefit categories covering Water Security, Poverty Alleviation, Carbon Offsets, and Ecosystem Restoration. Each of the Nature-based Solutions deliver benefits across some or all of these categories and have a direct and indirect impact on several beneficiaries. As far as possible, the monetary value of the benefits in these categories were integrated into the analysis.

The **Water Security** benefit considered the economic value of avoided water shortages owing to the water yield increases delivered from Nature-based Solutions upstream. These avoided water shortages have a direct economic impact on the downstream agricultural sector, domestic water users as well as the mining sector further afield.

The direct impact of avoided losses to irrigation supply was estimated using the value of mango and citrus yields that are dependent on water supply from the Blyderivierspoort Dam. Farmers make optimal use of limited irrigation water supply by prioritising higher value citrus crops for export markets, and applying lower volumes of water to mangoes which are still productive with less irrigation. Reducing irrigation supply and taking some crop areas out of production minimises agricultural yields and negatively impacts farming revenue. In periods where the Blyderivierspoort Dam volume is low, irrigation supply can be restricted by up to 60% of ordinary water allocations. These restrictions can lead to an agricultural revenue loss of almost R400 million ($ 23 million) in a single year.

The **Poverty Alleviation** benefit considered the impact to community participants in the CIP, as well as the indirect effect of water security on employment in the agricultural sector downstream. The positive impact on communal farmers who participate in Grazing Best Management Practices accounts for (i) increased income from improved livestock condition and access to markets, and (ii) cost efficiencies for participating communal farmers (avoided cost of winter feeding, veterinary services etc.).

Data from existing grazing management programmes show that improved cattle condition from better grazing leads to animals being 10% larger, meaning communal farmers also benefit from higher livestock or meat product sale prices.[13]

The **Carbon Offset** benefit valued the additional revenue to the CIP from the sale of verified carbon offsets in South Africa's voluntary carbon markets. The restoration of grasslands enables sequestration of up to 2 tonnes of CO2 (equivalent) per hectare[14]. These carbon offsets are converted to credits that can be sold to create sustainable revenue to the CIP. This revenue accounts for the transaction costs associated with the verification and sale of carbon credits.

The **Ecosystem Restoration** benefit quantified the area (hectares) of key habitats restored through Nature-based Solutions interventions, contributing to an increase in important biodiverse areas under proper management.

The CIP would also deliver several co-benefits, the most critical being the protection of employment through securing the ecosystem services that underpin livelihoods. Grazing Best Management Practices support 26 permanent annual employment opportunities (or 780 employment opportunities over the CIP's lifetime) and Invasive Alien Plant Clearing supports 579 employment opportunities over the full programme. The water secured for the downstream agricultural sector helps to protect 14,598 employment opportunities (both permanent staff and seasonal labourers). This was estimated as follows:

The average number of permanent staff (0.25 people per hectare) and temporary/seasonal labour (1.11 people per hectare) in the downstream commercial agricultural area.

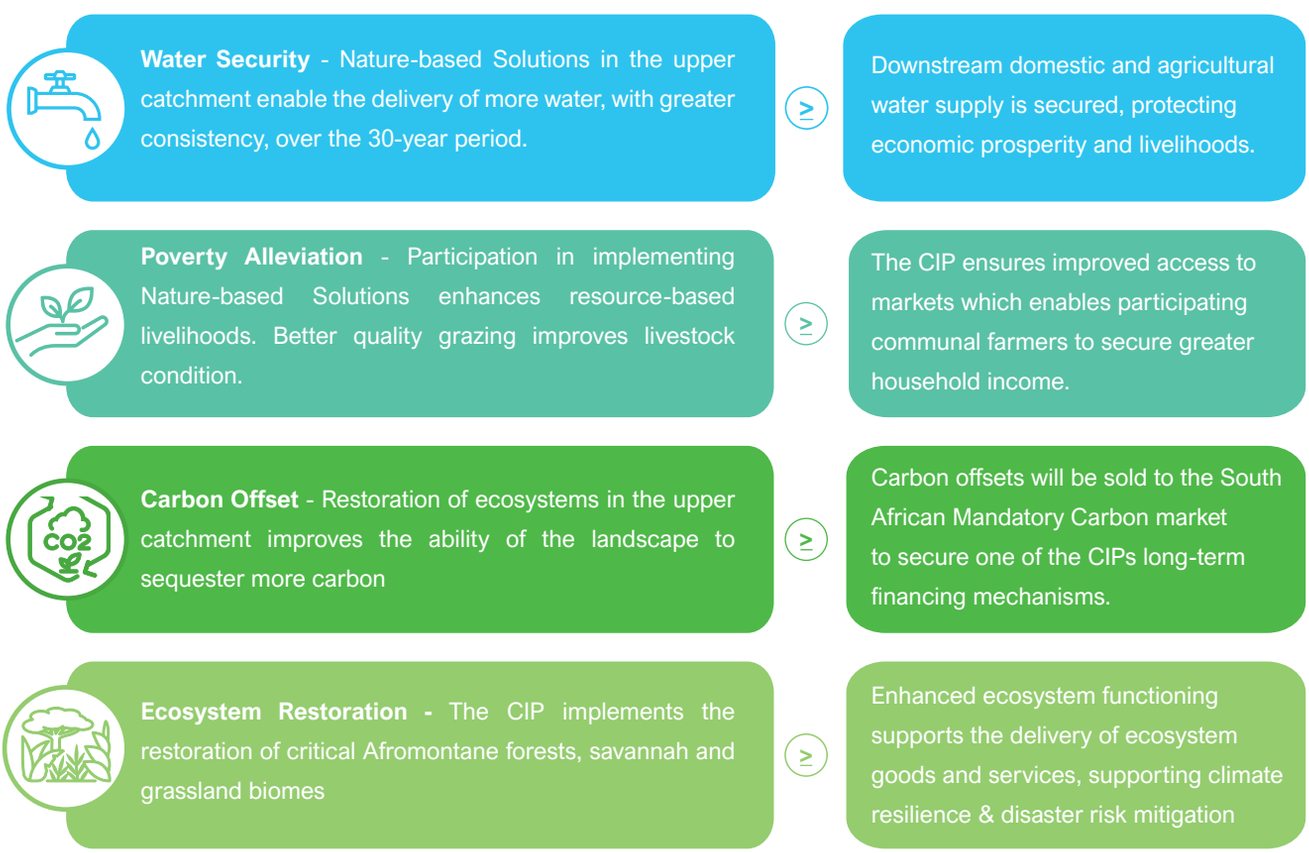


Fig 12 Benefit Framework for the Kruger to Canyons CIP

[11] Exchange rate of ZAR 17,45 to USD 1 was used based off the forecast average annual exchange rate as determined in March 2023.
[12] Best practice indicates 0,25 heads of cattle per hectare.

STEP 5 Building a discounted timeline for the delivery of impact

Following common practice, the annual time series of costs and benefits that the CIP would deliver were discounted to ascertain the present value of future costs and benefits. The timeline accounts for ecosystem restoration dynamics in that benefits are only fully realised after catchments are restored to their optimal functionality.

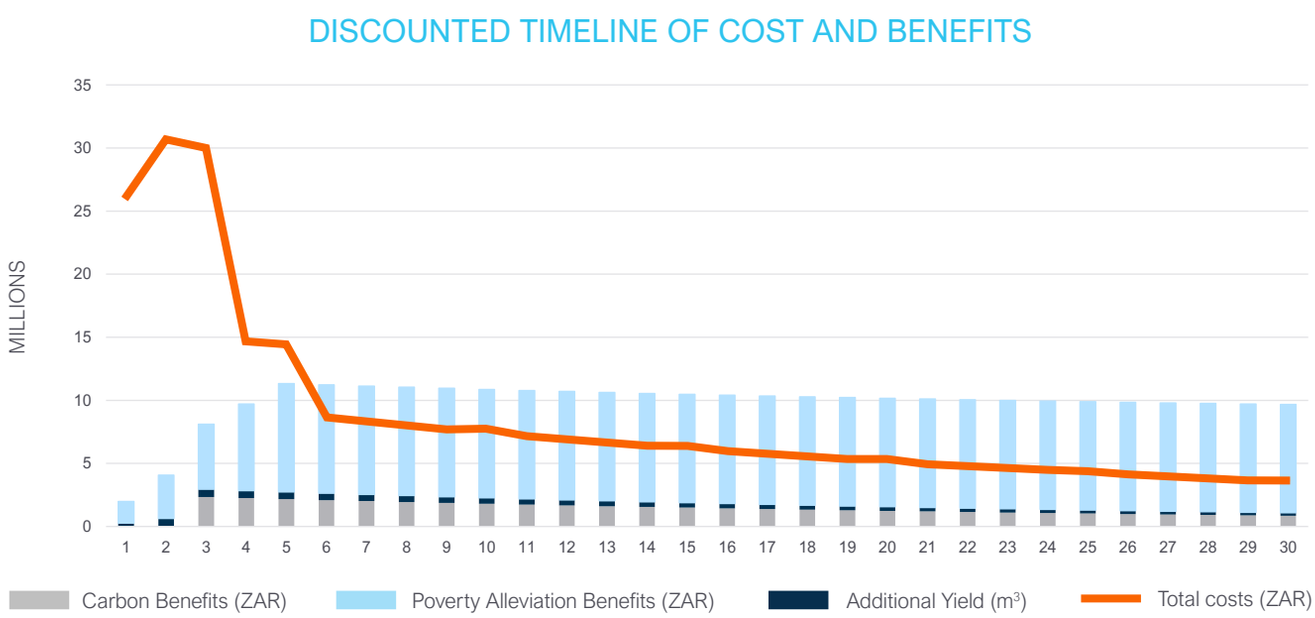
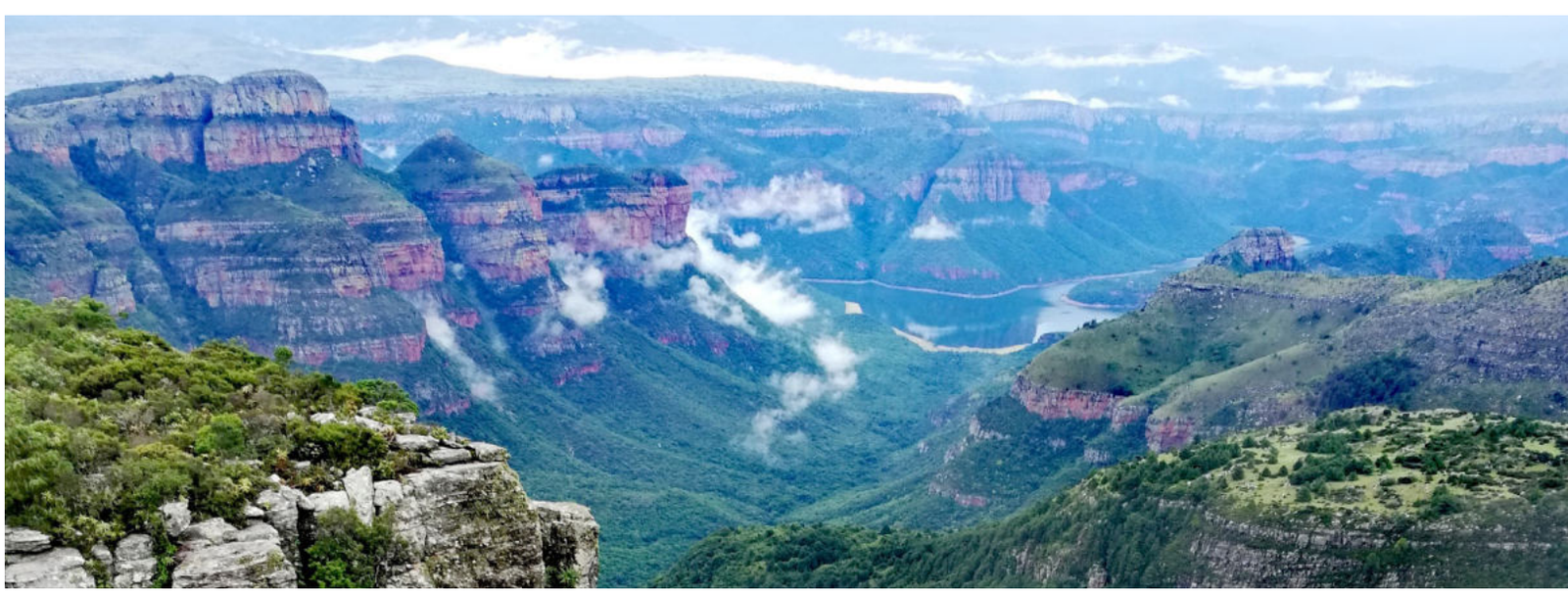


Fig 13 Discounted timeline of costs and benefits for the Kruger to Canyons CIP

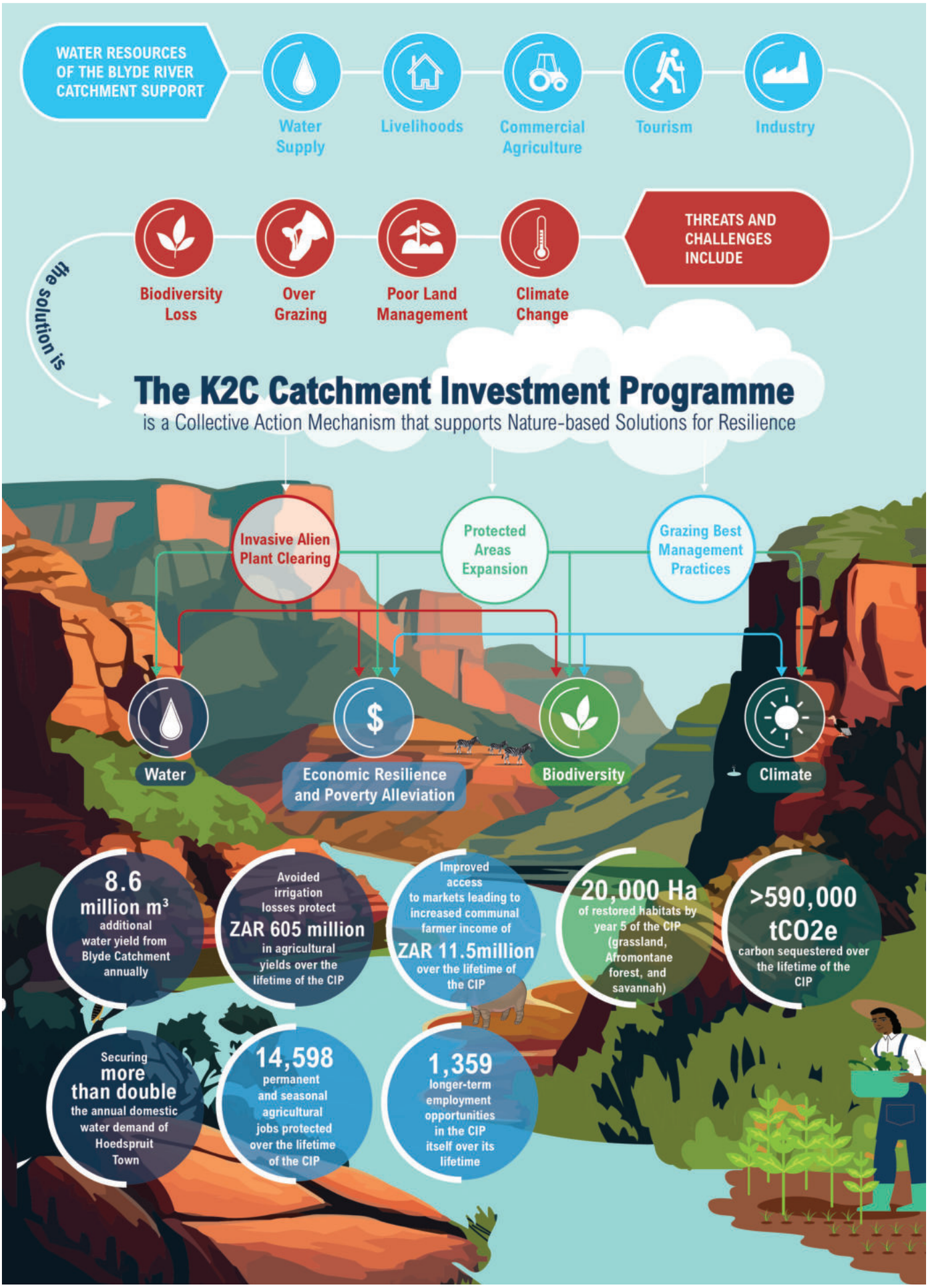


STEP 6

Evaluating the net benefit of the Kruger to Canyons CIP

The benefits are unlocked in several categories. The primary benefit is the delivery of 8.6 billion litres of additional water per year. This equates to more than double the annual water demand of Hoedspruit town and contributes to protecting R605 million ($34.6 million) worth of agricultural yield in the mango and citrus farms downstream of the Blyderivierspoort Dam. This additional water also benefits large towns and industries further downstream, predominantly the Phalaborwa Mining Complex for whom this supplemental bulk water would be valued at R63.5 billion ($3.6 billion).[5] Other benefits include Poverty Alleviation worth R11.5 million ($650 000) in additional household income to upstream communities, the restoration of over 20,000 ha of biodiverse ecosystems, and over R40 million ($2.3 million) in carbon offset value. Our valuation does not include avoided global damages from greenhouse gas mitigation that would result from the analysed Nature-based Solutions. Using the latest estimates of global damages from greenhouse gas emissions, the global value of the greenhouse gas mitigation achieved by the modelled Nature-based Solution activities would be over R770 million (doubling the Return on Investment of the CIP). The financial and economic appraisal presented in this Business Case shows that, for every South African Rand spent in the CIP, a Return on Investment of R2.50 is generated in a sustainably funded manner. Furthermore, cumulatively, the interventions create and protect almost 16,000 jobs.

Over a 30-year period, results show that investing R254 million ($14.5 mil) in Nature-based Solutions unlocks benefits worth R657 million ($37.7 mil).[4]


WATER RESOURCES OF THE BLYDE RIVER CATCHMENT SUPPORT
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Invasive Alien Plant Clearing
Protected Areas Expansion
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Water
Economic Resilience and Poverty Alleviation
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8.6 million m³ additional water yield from Blyde Catchment annually
Avoided irrigation losses protect ZAR 605 million in agricultural yields over the lifetime of the CIP
Improved access to markets leading to increased communal farmer income of ZAR 11.5million over the lifetime of the CIP
20,000 Ha of restored habitats by year 5 of the CIP (grassland, Afromontane forest, and savannah)
>590,000 tCO2e carbon sequestered over the lifetime of the CIP
Securing more than double the annual domestic water demand of Hoedspruit Town
14,598 permanent and seasonal agricultural jobs protected over the lifetime of the CIP
1,359 longer-term employment opportunities in the CIP itself over its lifetime

04

Stewarding our investment

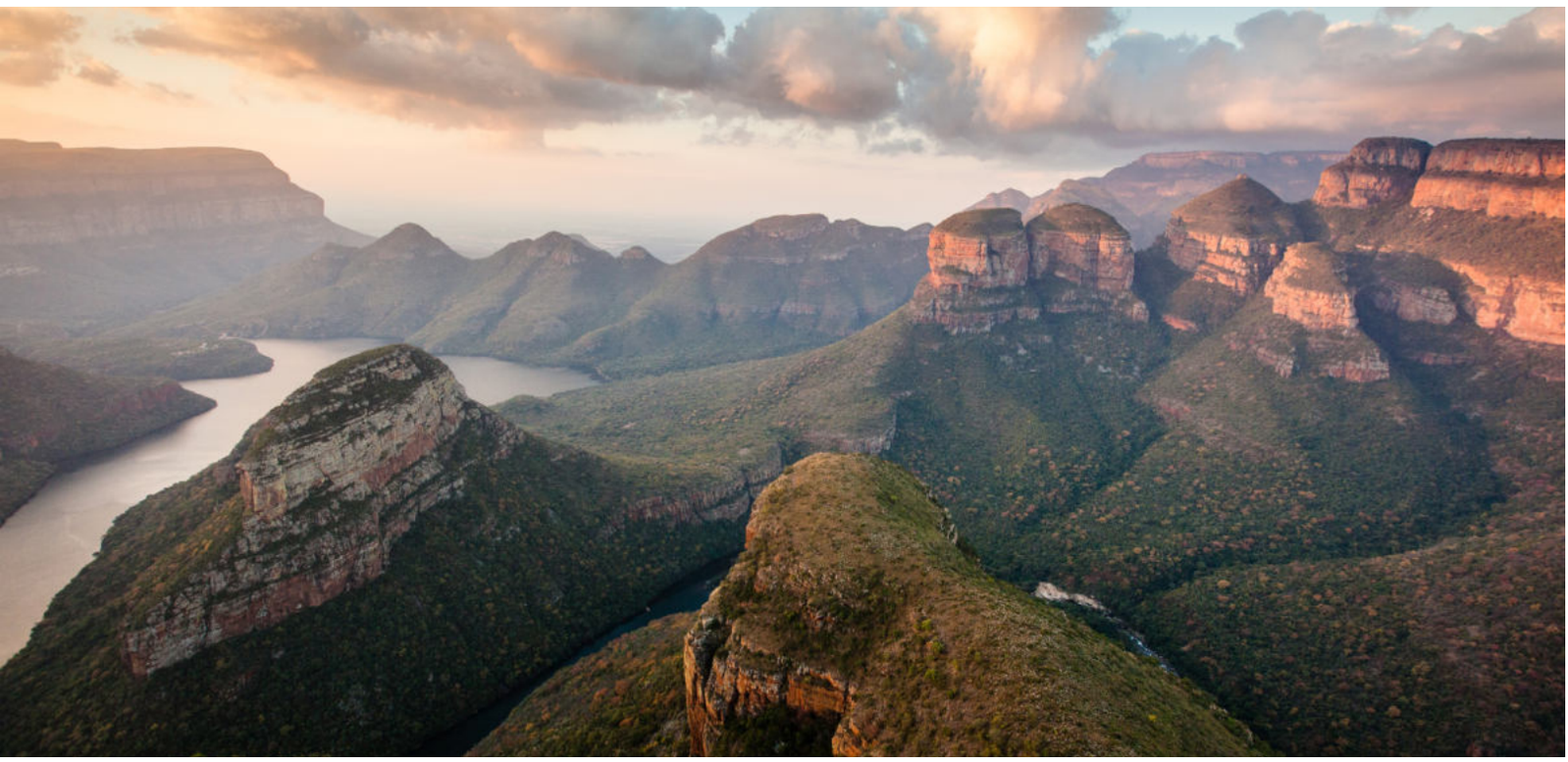
4. Stewarding our investment

4.1 Protected Areas Expansion

The broader Kruger to Canyons Biosphere Region, within which the Blyde River Catchment is located, contains extremely high levels of biodiversity and endemism, with diverse plant communities supporting an equally rich variety of birds, mammals, reptiles and insects. Yet this landscape has become fragmented, with tenuous ecological corridors between the Kruger National Park in the lowveld to the escarpment and the upper Blyde River Catchment in the highveld.

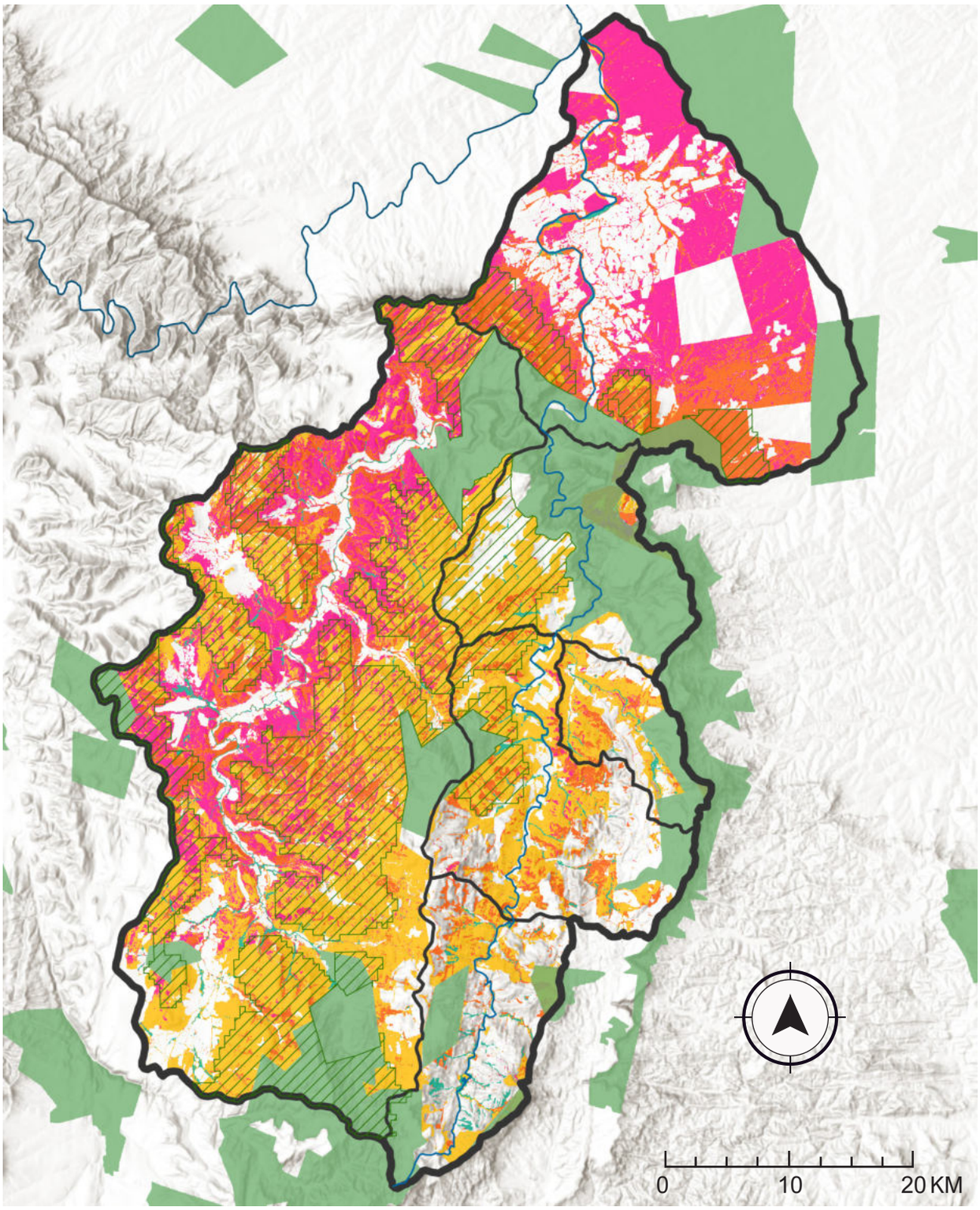
Fig 14 Biodiversity within the Kruger to Canyons Biosphere Region

To date, only 16% of the Kruger to Canyons Biosphere Region is protected, highlighting the need for an approach that supports scaling up interventions. A large portion of this unprotected area coincides with the Strategic Source Water Area. This undermines the ability of the catchment to deliver water security, as future land-use changes are left unchecked. To secure the investment in nature, the CIP has identified that formally protecting the areas where solutions are implemented contributes to securing the long-term success of the programme.



One of the most flexible approaches to expanding protected areas is via biodiversity stewardship. ***Biodiversity stewardship is by far the most cost-effective way to secure priority areas for water security and biodiversity. In the long-term, this approach costs between 70 and 400 times less per hectare than land acquisition and the cost of supporting the management is between 4 and 17 times lower[15].***

Agreements are made with private and communal landowners to protect and manage their land identified within biodiversity priority areas and in return landowners receive benefits, such as fiscal and rates rebates, along with management assistance. Biodiversity stewardship also plays an important role in enabling and supporting developments in the region by providing land that meets biodiversity offset requirements. The majority of the remaining intact forests, grasslands, savannahs and wetlands in the Blyde River Catchment fall within priority areas listed under the country's National Protected Area Expansion Strategy (2016). This presents an opportunity to protect these remaining diverse ecosystems within the CIP focus area. It provides further opportunity for landowners to support and complement catchment-wide Nature-based Solutions interventions, exponentially enhancing water security and biodiversity benefits. Biodiversity stewardship has been successfully implemented within various communal settings in South Africa and is complementary and supportive of Grazing Best Management Practices. The CIP will engage with key and willing beneficiaries and landowners to facilitate the expansion of protected areas to secure the long-term impact of the Nature-based Solutions implemented by the programme.



Legend

Blyde River

Blyde Quarternary Catchment

Blyde Catchment

National Protected Areas Expansion Strategy

National Priority Focus Areas

Protected Areas

Vegetation Type

Forest

Savanna

Grassland

Wetlands

Fig 15 Priority areas for Protected Areas Expansion

4.2 Measuring our impact

The CIP is designed to have lasting, positive impact across the Kruger to Canyons Biosphere Region. Measuring and accounting for this impact is a cornerstone of the CIP's purpose and longevity. This will be achieved by implementing a practical Monitoring, Reporting and Verification Framework, which has the following multi-purposes: (i) enabling efficient monitoring, collection and analysis of data from Nature-based Solutions implementation; (ii) accounting for impact to Kruger to Canyons donors, partners and investors, on a regular basis; and (iii) leveraging strong, verified impact metrics to crowd-in new partners and investors.

To achieve this, the CIP is developing a Monitoring, Reporting and Verification Framework that has five core components, introduced in the figure that follows.[16] These components underpin the activities, roles and responsibilities for monitoring, reporting and verification.

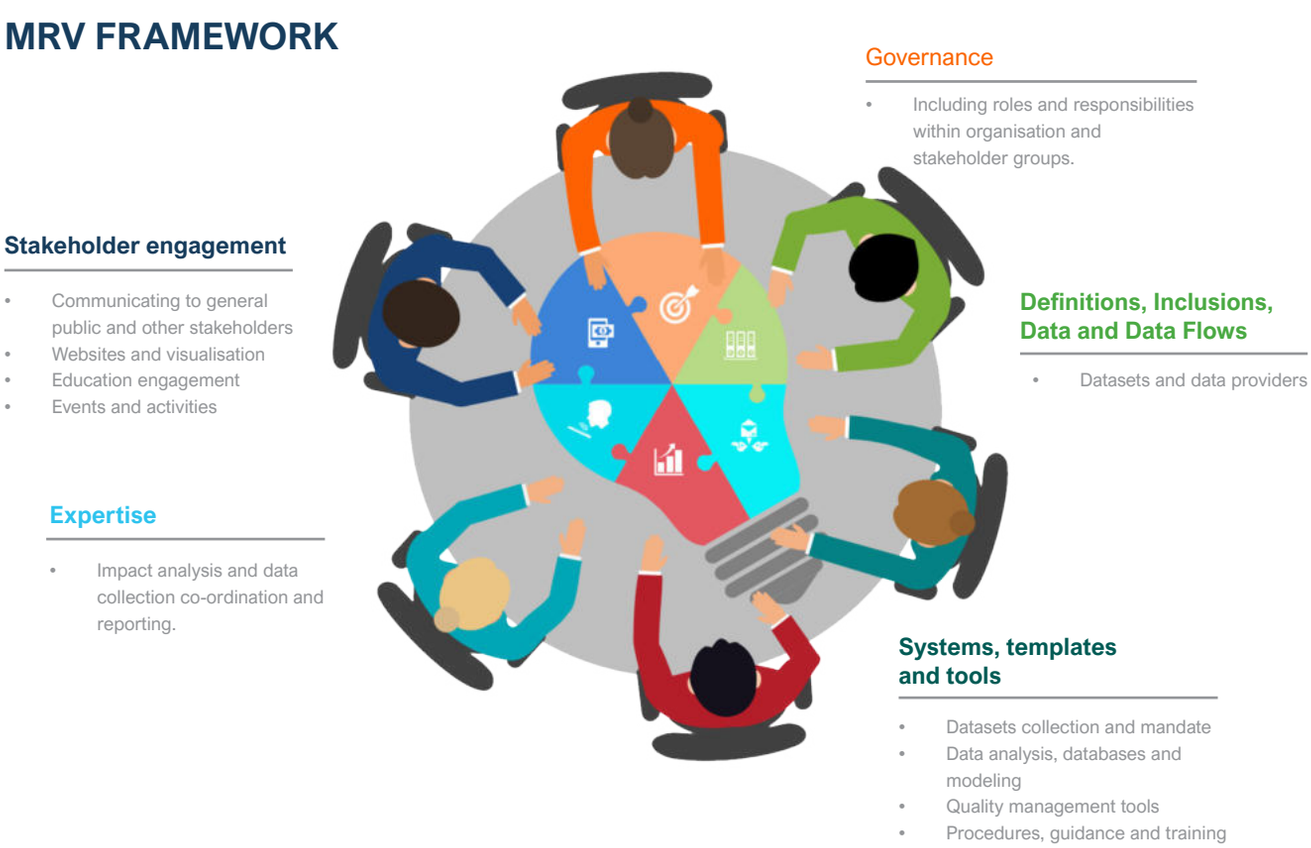


Fig 16 Monitoring, reporting and verification framework for the CIP (Aether, 2023)

A Monitoring, Reporting and Verification Framework is brought to life using an MRV System. For the CIP, a multi-faceted Decision Support System has been developed that combines hydrological, biological and financial information to monitor, report and verify the impact of Nature-based Solutions implemented for the Kruger to Canyons Biosphere Region. In addition to being a system to collect and process data, it supports decision-makers to enable more coherent governance among key actors and stakeholders, which improves water security and biodiversity protection.

The Monitoring, Reporting and Verification System has two key stages: (i) ex-ante, the period prior to Nature-based Solutions implementation where impact is parametrised and metrics are selected; and (ii) ex-post, the period after Nature-based Solutions implementation has happened, when monitoring, reporting and verification are taking place in their own regular frequencies. The Monitoring, Reporting and Verification System is constructed using globally recognised and/or best-in-class principles, approaches, standards and reporting requirements. These two stages are illustrated in the image that follows.

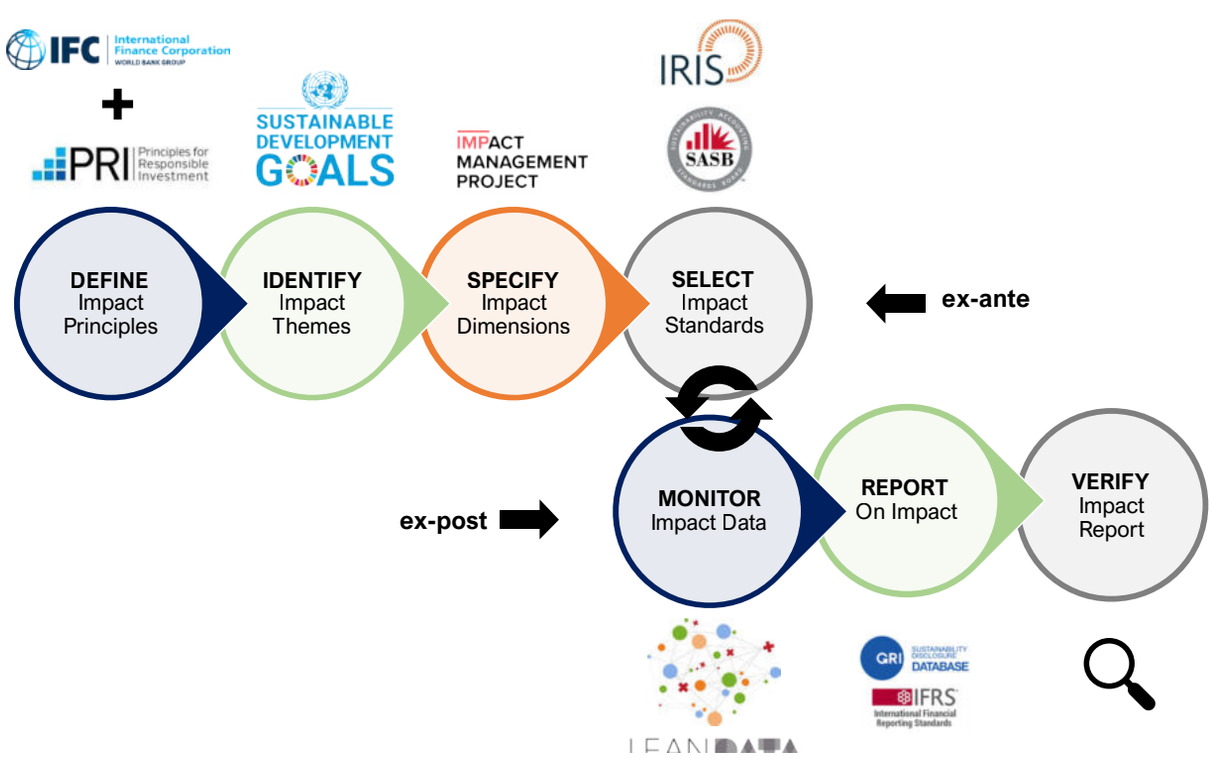
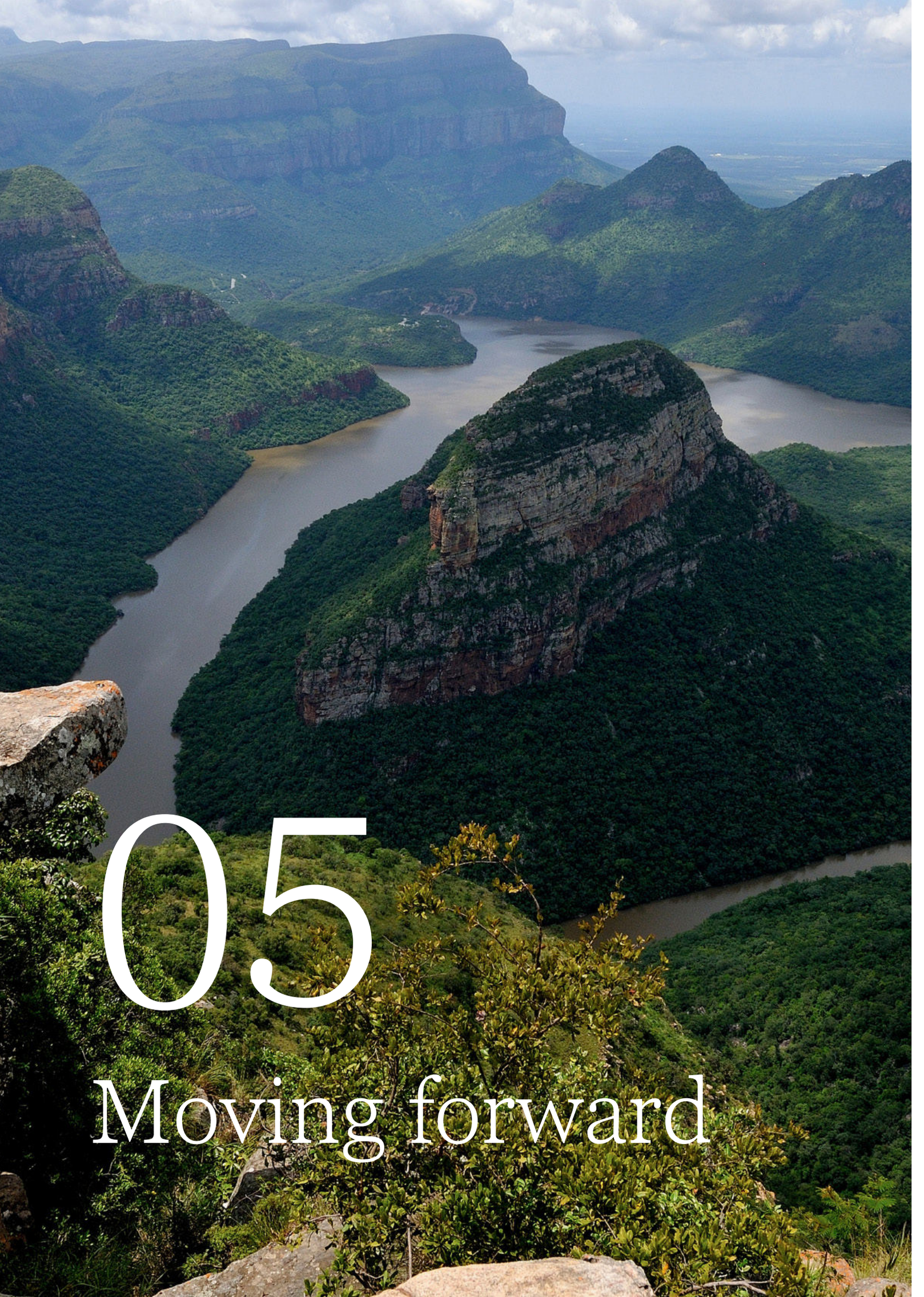


Fig 17 Monitoring, reporting and verification System for the CIP

The Decision Support System has been designed to track progress and communicate key results related to the CIP's activities, so that it supports integrated catchment management. This will be done through visual maps and graphical representations for each Nature-based Solution being implemented in the priority areas. The Decision Support System also allows the CIP partners to spatially monitor implementation progress against targets and measure the impact of their Nature-based Solutions interventions across the landscape. Well monitored data coupled with verified impact reporting has proven to attract additional funding and investment over time.



05 Moving forward

5. Moving forward

This Business Case shows that a 30 investment of R254 million ($14.5 million) over 30 years enables the CIP to realize benefits of R657 million ($37.7 million).[4] This investment covers all costs associated with the CIP, including implementation of NbS and ongoing management costs.

The benefits are delivered in several ways. The primary benefit is the delivery of 8.6 million cubic metres of additional water per year. This equates to more than double the annual water demand of Hoedspruit town and contributes to protecting R605 million ($34.6 million) worth of agricultural yield in the mango and citrus farms downstream of the Blyderivierspoort Dam. This additional water also benefits large towns and industries further downstream, predominantly the Phalaborwa Mining Complex for whom this supplemental bulk water would be valued at R63.5 billion ($3.6 billion).[5] Other benefits include Poverty Alleviation worth R11.5 million ($650 000) of additional household income to upstream communities, the restoration of over 20,000 ha of biodiverse ecosystems, and over R40 million ($2.3 million) in carbon offset value.

The impact assessment presented in this Business Case shows that, for every South African Rand spent on Nature-based Solutions, a return of R2.50 is generated in a sustainably funded manner. Furthermore, cumulatively, the interventions create and protect almost 16,000 jobs.

To realise all of these long-term benefits, the CIP must be established in two phases. In the first 5 years – the High-Impact Phase – the CIP requires R125 million ($7 million) of funding to initiate operations and scale-up Nature-based Solutions implementation. Over this period the CIP will also fully establish its governance arrangements and its long-term sustainable financing mechanisms.

Seed capital provided for the High-Impact Phase will support the CIP's ability to prove its impact. This proof will catalyse longer-term support from a range of sustainable finance providers. The source of sustainable finance will be a blend of carbon credits, biodiversity compensation payments, and potential catchment levies. The CIP will optimise its governance and implementation arrangements to ensure effective delivery of benefits, at scale. If seed capital is received and the first phase is successful, it will help secure the R260 million ($14.9 million) required to sustainably fund restoration and conservation activities over 3 decades.

Following this Business Case, the programme will move through detailed design before reaching full execution and operationalisation by 2024. From 2025 onwards, the CIP will deliver implementation of Nature-based Solutions at scale.

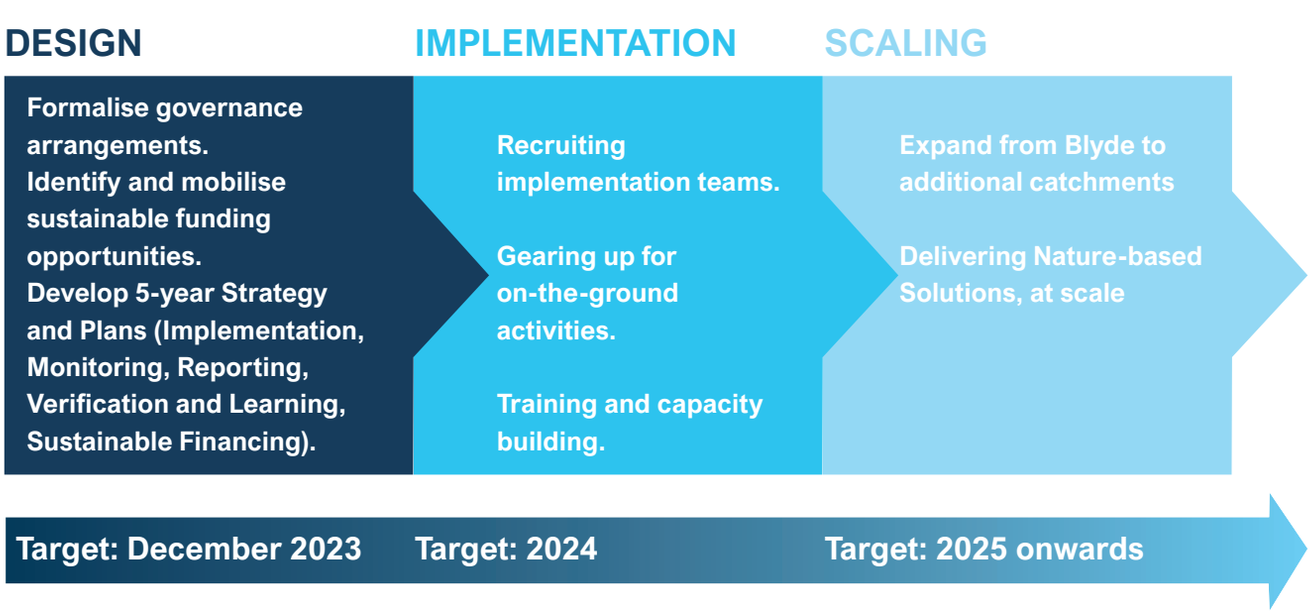


Fig 18 The Next Steps for the Kruger to Canyons CIP

End Notes

1. Dini J., Everson C., Marais C., Ivey, P., 2015. Ecological Infrastructure Case Study 2: Water Thieves. SANBI, 2015
2. WRI, 2021: What's to be done about that dam silt! Water Resource Management. The Water Wheel. July/ August 2021
3. The pipeline that supplies water from Blyderivierspoort Dam is pressure driven, meaning that when the levels drop below 60%, water conservation or water usage limits are applied, impacting on water supply.
4. All figures are quoted in present value terms, discounted over 30 years at a social discount rate of 3.66%. Discount rates are used to put a present value on costs and benefits that will occur at a later date.
5. This figure represents revenue from the sale of 8.6 Mm3 of water to industrial users (Phalaborwa Mining Complex) at a bulk water tariff of R7.38 per cubic metre.
6. Dini J., Everson C., Marais C., Ivey, P., 2015. Ecological Infrastructure Case Study 2: Water Thieves. SANBI, 2015
7. https://www.iucn.org/our-work/nature-based-solutions
8. Arnold, J. G. et al. 1998: 'Large Area Hydrologic Modelling and Assessment Part I: Model Development', JAWRA Journal of the American Water Resources Association, 34(1), pp. 73–89.
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10. Costs as per the 2023 calendar year.
11. Exchange rate of ZAR 17,45 to USD 1 was used based off the forecast average annual exchange rate as determined in March 2023.
12. Best practice indicates 0,25 heads of cattle per hectare.
13. Arena G and Hawkins H-J (2023). Climate-smart rangeland guidelines for communal lands in South Africa (version 1).
14. Carbon impact was modelled using Conservation International's CPLUS model.
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16. Aether. 2023. Inspired by Handbook on institutional arrangements to support MRV/transparency of climate action and support. Consultative Group of Experts. UNFCCC. June 2020

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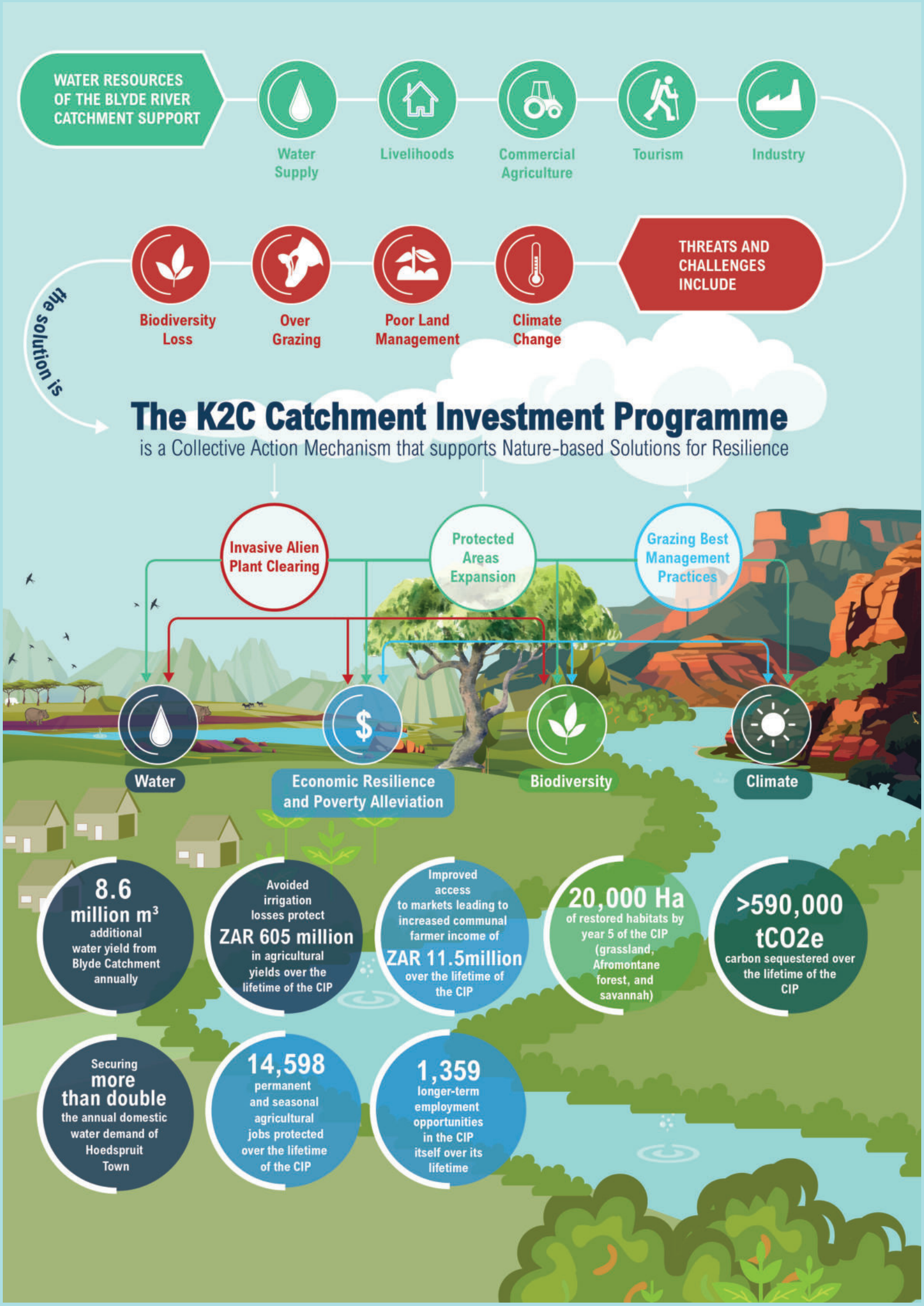
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The Nature Conservancy

CONSERVATION SOUTH AFRICA
Member of the CI Network

KRUGER TO CANYONS
BIOSPHERE REGION

Nature for Water
FACILITY


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