SEBEI

Investment Brief: Ecological Infrastructure for Water and Socio-Economic Security

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This investment brief showcases the full spectrum of social, economic and environmental benefits that can be generated from water-related Ecological Infrastructure interventions, with the intention of piquing the interest of private and public investors.

The presented benefits are a combination of evidence-based research outputs from the Socio-Economic Benefits of Ecological Infrastructure (SEBEI) project, as well as other research. To make navigating this brief easier, we have summarised the benefits according to different investor types (**Table 1**).

Since the type and magnitude of benefits that can be generated from Ecological Infrastructure interventions are often context-specific, this set of benefits will differ for specific localities, as well as for different investor types.

Image (page 1 and 2): Water levels of the Theewaterskloof Dam, part of the Western Cape Water Supply System, were very low during the recent south-western Cape drought. Invasive alien tree invasions upstream of this dam placed additional strain on water security, due to their high water-use. Clearing these invasions of trees is necessary for ecosystem restoration and to improve water security.

Image credit: Cape Winelands Biosphere Reserve

Key messages

Diverse benefits arise from water-related Ecological Infrastructure interventions, which can be used to attract capital from different investor types (**Table 1**).

Ecological Infrastructure interventions address both South Africa's water and social challenges, but the current level of funding is insufficient for realising the full potential of ecological and social benefits.

The private sector potentially has a greater role to play in Ecological Infrastructure investments in South Africa, but generally requires a return on investment.

Returns are not deemed to be solely financial: certain investors are willing to receive a lower financial return in exchange for a positive social or environmental impact.

A number of financial mechanisms can be used to direct funding to Ecological Infrastructure interventions and provide investors with the returns that they seek.

Fynbos shrublands infested with invasive alien pines in the Upper Berg Catchment, South Africa. This drone image shows recently cleared (brown) and uncleared (green) parts of the mountains. These pine trees consume large quantities of water, and their clearing can improve the water security of the city of Cape Town.

Image credit: Cape Winelands Biosphere Reserve

Definitions

Ecological Infrastructure is defined as "the underlying framework of natural elements, ecosystems and functions and processes that are spatially and temporally connected to supply ecosystem services".[1]

An **Ecological Infrastructure intervention** is an action to enhance certain ecosystem services in a spectrum of landscapes (from natural to transformed), informed by an understanding of ecology. Actions can be artificial or natural, including artificial wetlands, permeable pavements, alien clearing, wetland revegetation and gabions and weirs to halt erosion.[2]

Benefits are all positive outcomes of an Ecological Infrastructure intervention.

Return on investment (ROI) is the financial and non-financial benefits generated from a specific investment in an Ecological Infrastructure intervention.

Financial returns provide the investor with a monetary benefit. An example would be a corporation investing in the rehabilitation of a wetland, resulting in lower water treatment expenses at a downstream water abstraction site.

Non-financial returns provide the investor with social or environmental benefits. An example would be a corporation investing in the rehabilitation of a wetland, resulting in improved health for downstream water users.

Berg River, Western Cape Province.
Image credit: Landcare, Department of Agriculture, Western Cape Province.

Table 1. Benefits that may appeal to different types of investors in Ecological Infrastructure interventions.

Benefits from Ecological Infrastructure interventions	**SUSTAINABLE DEVELOPMENT GOALS**	**Investor Types**					
		Corporate (private businesses)	Public (Government, parastatals)	Institutional (e.g. asset managers, banks)	Institutional (impact investors)	Landowner (e.g. private farmers)	Philanthropist (e.g. NGOs)
Employment creation	1, 5, 8		●		●		●
Socio-economic benefits to people employed on interventions	1, 5, 8, 10	●	●		●		●
Water security and assurance of supply	6, 9	●	●	●	●	●	●
Disaster and systemic risk reduction	11, 13	●	●	●	●	●	●
Improved biodiversity	14, 15	●	●		●	●	●
Increased land productivity and revenue opportunities	1, 2	●	●			●	
Reduced health risks	3	●	●		●	●	●
Sense of security	16	●	●		●	●	●
Builds resilience to climate change	11, 13	●	●	●	●	●	●
Defers hard infrastructure investments	9, 11		●			●	
Positive impact on existing hard water infrastructure	9, 11		●	●	●	●	
Financial return on investment	17, 8	●	●	●	●	●	
Reduced value chain risks	17, 11	●	●	●	●		
Compliance with regulations and incentives	12	●	●	●	●	●	
B-BBEE scorecard points	17	●		●	●		

Setting the scene

South Africa faces considerable water challenges in terms of both water supply and water quality. Around 98 % of the country's total reliable surface water supply has already been allocated to users and South Africa's freshwater resources are becoming increasingly polluted and turbid and are considered to be moderately to highly eutrophic.[3, 4] Owing to dwindling available surface water resources, declining water quality and growing urban and commercial demand, water demand is predicted to exceed available water supply within the next decade.[5, 6] South Africa also faces a number of social challenges, including poverty, unequal access to services and resources, high unemployment and violent crime.[7]

Investments in the restoration, maintenance and construction of Ecological Infrastructure have been identified as an important measure to address South Africa's water and social challenges.[8] They can be a key element in South Africa's transition towards the "Green Economy" by delivering enhanced ecosystem services alongside opportunities for unskilled and semi-skilled employment (**Figure 3**). To date, the clearing of invasive alien trees accounts for the majority of investments in Ecological Infrastructure projects in South Africa, as this activity has been estimated to contribute significantly to enhanced water supply[9, 10] at a fraction of the cost of hard infrastructure options[11]. More recently, there has been growing investment in wetland rehabilitation and restoration.[12] Apart from the water-related benefits, these intervention types also contribute to fire, flood and drought risk reduction as well as improved biodiversity (**Figure 3**).

Ecological Infrastructure interventions also complement existing hard water infrastructure,[8] in many cases increasing the efficiency and longevity of hard infrastructure. This results in cost savings for operators associated with purifying water at water treatment plants or less frequent dredging requirements at dams owing to less siltation. Furthermore, Ecological Infrastructure interventions may limit the need for or defer investments in hard infrastructure,[8] such as raising dam walls or building new dams.

There are two dominant sources of funding for Ecological Infrastructure interventions in South Africa. The first is the public sector, largely through the National Government's Natural Resource Management programme. The second is the private sector (corporates and other private businesses), generally through water stewardship programmes or donations.[13]

The Socio-Economic Benefits of Ecological Infrastructure (SEBEI) project

This investment brief is an output under the Danida-funded Socio-Economic Benefits of Ecological Infrastructure (SEBEI) project coordinated by the University of Cape Town and the University of Copenhagen. The project set out to strengthen the case for investing in water-related Ecological Infrastructure, while:

1. supporting well-functioning livelihood strategies and value chains;
2. creating new livelihood opportunities; and
3. reducing hydroclimatic risks.

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These sources of funding, although significant, are not enough to meet the water-related Ecological Infrastructure intervention requirements in South Africa.[14, 15] They are either limited by a financially constrained treasury or subject to changing sentiments. Indeed, large upfront capital is required to deal with the problem sufficiently[a] (**Figure 1**).

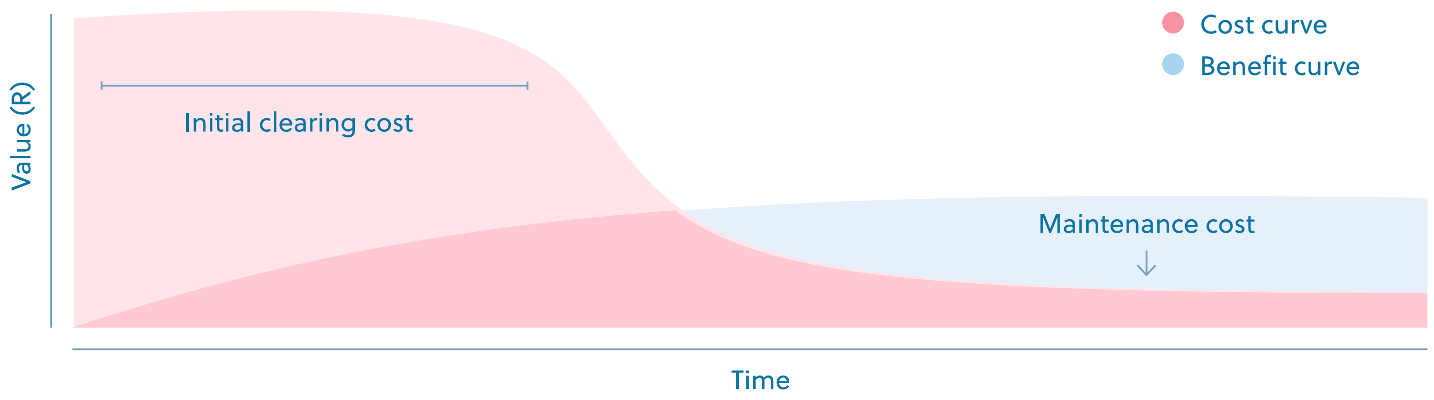


Figure 1. Typical cost and benefit curves for Ecological Infrastructure interventions.

The private sector can be an important source of investment. Institutional investors, such as asset managers, banks and pension funds, could play a larger role, provided a suitable financial return can be generated. But other private investors, such as impact investors or businesses seeking to invest in public and social goods, are often willing to receive a lower financial return (**Figure 2**).

Several financial mechanisms can be used to direct funding to Ecological Infrastructure projects and provide investors with the financial and non-financial returns that they seek (**Table 2**). Apart from public sector budgets, the mechanisms used in South Africa generally aim to either recoup costs gradually over time (such as through water tariffs or levies) or incentivise actors to change their behaviour (such as through certification schemes or the Land User Incentives programme).

Table 2. Some mechanisms for financing Ecological Infrastructure interventions.[16]

Investor types	Mechanism
Public	Government budgets and infrastructure grants
	Debt-for-nature-swap
Corporates	Stewardship
	Corporate Social Investments
Landowners	Taxes (water pricing/tariffs/levies or legislation)
	Incentives (Land User Incentives programme/ certification schemes/credits)
Institutional investors	Bonds
	Parametric or event-based insurance
Philanthropists	Donations
All	Blended finance
	Payments for Ecosystem Services

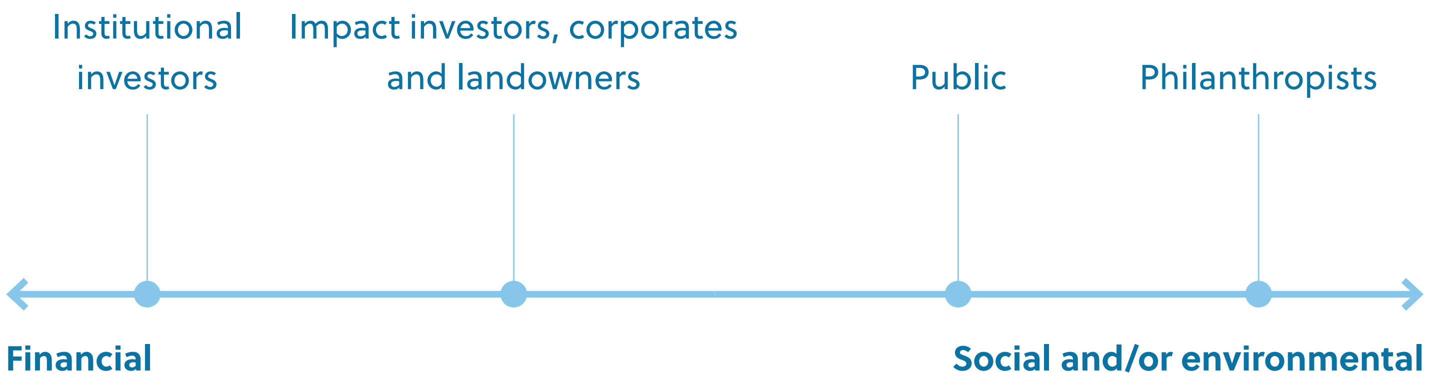


Figure 2. Motivations for investment across different investor types.

Ecosystem service benefits of investing in Ecological Infrastructure

Ecological Infrastructure interventions are wide-ranging, from general restoration of degraded areas to altering land management. These interventions result in changes to a number of ecosystem services (**Figure 3**), as well as contribute to the attainment of many of the Sustainable Development Goals (**Table 1**). Ecological Infrastructure interventions considered under the SEBEI project include the clearing of invasive alien trees and wetland rehabilitation. An important finding from SEBEI is that context is important for understanding the impacts of Ecological Infrastructure interventions on ecosystems services.

Figure 3. The effects predicted for SEBEI-considered Ecological Infrastructure interventions on ecosystem services.

Spectrum of benefits

Investments in water-related Ecological Infrastructure (such as the clearing of invasive alien trees and rehabilitation of wetlands) provide a number of benefits to the investors, the people employed to carry out the intervention and broader society,[17, 18] including the following:

1. Employment creation[19, 20]

Investments in Ecological Infrastructure interventions create employment for unskilled and semi-skilled workers.[21]

2. Socio-economic benefits to people employed on interventions[20, 22]

People employed on Ecological Infrastructure interventions realise an improved income which benefits their households in the following ways: lower levels of indebtedness[21]; better food security[21]; access to both environmental and general education[23, 24]; physical and mental health benefits[24]; gender equality[21]; stronger social networks and new business opportunities[23, 24].

Click here to view evidence from the SEBEI project.

3. Water security and assurance of supply[25, 26, 27, 28]

Clearing of invasive alien trees increases streamflow and water yield, especially low flows and during the dry season. The rehabilitation of wetlands through the deactivation of artificial drainage channels improves the retention and distribution of water across the wetland. This may improve baseflow contributions to streamflow.

Click here to view evidence from the SEBEI project.

4. Disaster and systemic risk reduction[29]

Ecological Infrastructure interventions can reduce the risk of natural disasters such as fires, floods and droughts[30, 31] and the subsequent devastating impacts on people and the economy[32, 33].

5. Improved biodiversity

Appropriate restoration and rehabilitation[34] of degraded areas enhances biodiversity through increasing plant diversity[35, 36] and therefore terrestrial and aquatic faunal diversity[37].

6. Increased land productivity and revenue opportunities[38]

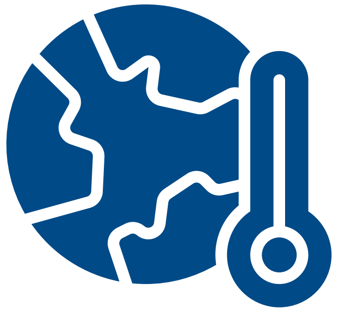
Ecological Infrastructure interventions lead to increases in land productivity, which lead to new and increased harvested resources, better quality agricultural products and higher land value. In some cases they also increase opportunities for tourism.

7. Reduced health risks

Ecological Infrastructure interventions aimed at improving water quality, such as restoring or rehabilitating wetlands, may have a positive impact on the health of people[39] by improving water purification.

8. Sense of security[22]

There is a perception that dense stands of alien trees create an enabling environment for criminal activities[40] and clearing these stands removes this perceived risk[37], improving the community's sense of security.



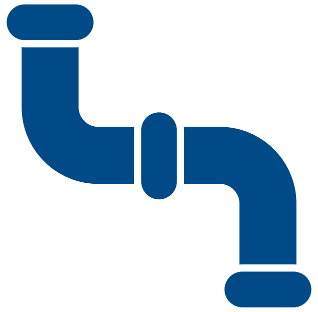
9. Builds resilience to climate change[29]

Clearing invasive alien trees reduces the risk of a changing climate on water security. It does this by reducing the influence of human-induced climate change on hydrological drought.

Click here to view evidence from the SEBEI project.

10. Defers hard infrastructure investments

Investments in Ecological Infrastructure may generate sufficient ecosystem services, such as water purification and provision, flood attenuation, or erosion control (**Figure 3**), that allows investments in hard infrastructure to be deferred[8].



11. Positive impact on existing hard water infrastructure

Ecological Infrastructure interventions complement existing hard water infrastructure, in many cases increasing the efficiency and longevity of the infrastructure[8], resulting in cost savings for operators. For example, well-functioning wetlands may prevent sedimentation build-up in dams, reducing the need for dredging.

12. Financial return on investment[41]

In certain circumstances, clearing alien trees may generate sufficient additional water in the system to provide a financial return on investment.

Click here to view evidence from the SEBEI project.

13. Reduced value chain risks

Many companies see the value of investing in Ecological Infrastructure to reduce water-related risks to their businesses, such as supply chain risks to retailers who rely on agricultural suppliers, or assurance of supply risks for significant direct water users.[42, 43]

14. Compliance with regulations and incentives

Landowners and corporates are often required to adhere to environmental regulations[b], or they may be incentivised to undertake Ecological Infrastructure interventions, such as via sustainability certification schemes[c] or insurance premium reductions[44].

15. Broad-Based Black Economic Empowerment (B-BBEE) scorecard points[41]

Corporates contributing to Ecological Infrastructure interventions can showcase their commitment to sustainability and where corporate social investment (CSI) budgets are directed to Ecological Infrastructure interventions, corporates can earn socio-economic development points on their B-BBEE scorecards.

Click here to view evidence from the SEBEI project.

Evidence from the SEBEI project

SEBEI researchers worked in the Berg, Breede and uMngeni catchments in South Africa to assess the hydrological and socio-economic impacts of Ecological Infrastructure interventions.

These three catchments are of socio-economic importance and contain strategic water sources upstream and large cities downstream (Cape Town, Durban) with strong rural-urban linkages. The catchments have a maximised engineered water supply system with no further built infrastructure options and deteriorating water quality.

SEBEI activities in the research sites included:

- A **systematic inventory** of existing Ecological Infrastructure interventions and identification of **scalable typologies**
- **Fine scale modelling and mapping** of hydrological benefits
- Assessment of **direct and indirect socio-economic benefits** of workers and landowners
- Review, identification and modelling of **financial mechanisms** suitable for funding the restoration and maintenance of Ecological Infrastructure
- **Iterative stakeholder engagement** to co-create knowledge and strengthen the community of practice through a series of seven interactive workshops

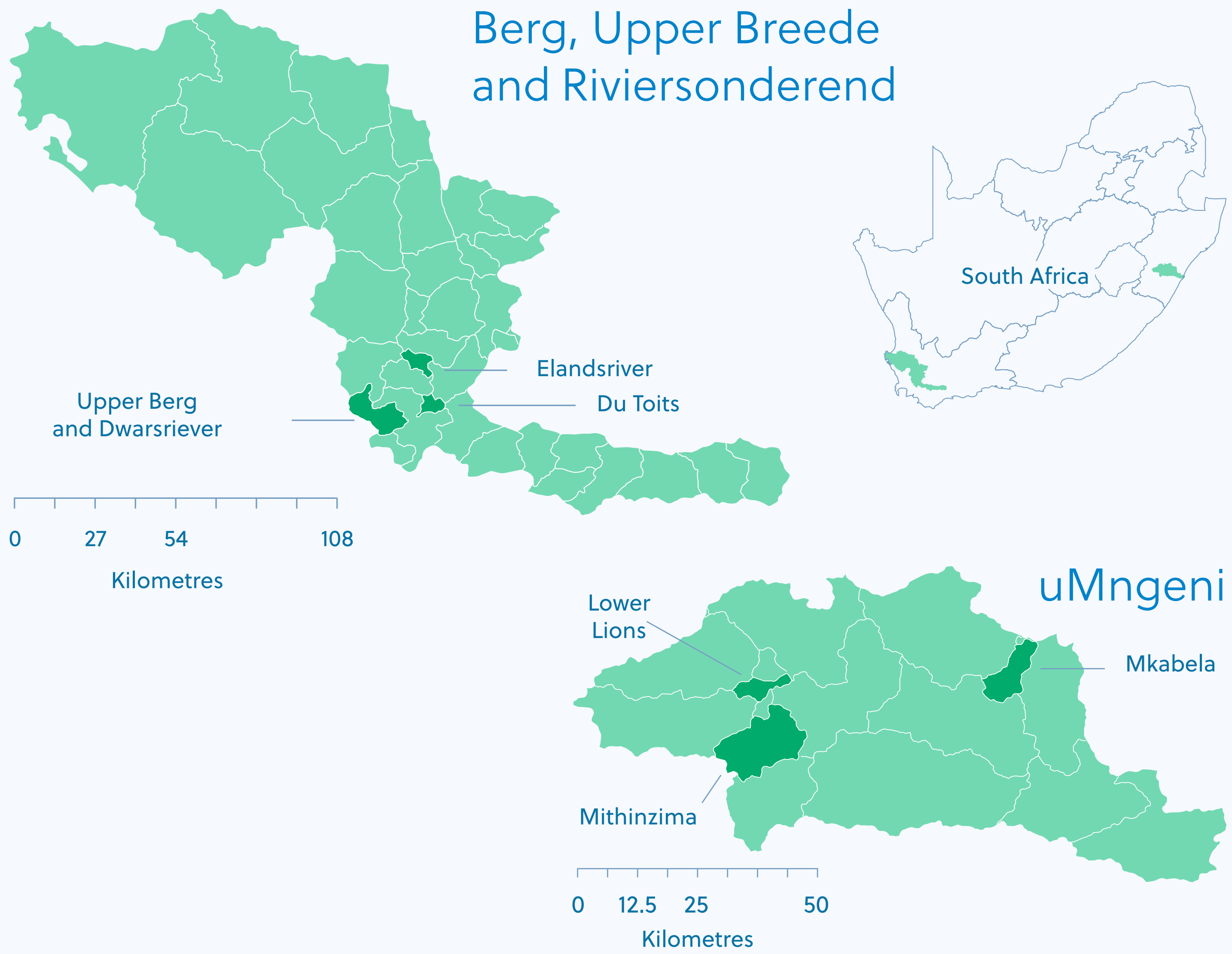


Figure 4. The catchments in which SEBEI undertook its research, with the sub-catchments where detailed hydrological modelling occurred highlighted in dark green.

Scenario planning at 2nd SEBEI stakeholder workshop.
Image credit: Carina Wessels

Fieldwork (taking soil samples, river cross-section measurements etc) in the Upper Berg and Breede catchments to inform the hydrological modelling.
Image credit: Carmen María de León (left), Petra Holden (right)

Return to spectrum of benefits

2. Socio-economic benefits to people employed on interventions[22]

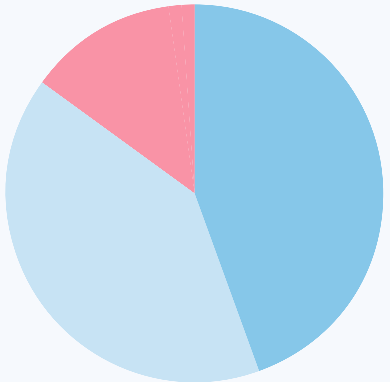
Benefits to employed workers: lessons from the uMngeni catchment

86%

of workers experienced great or moderate improvements to their **household income.**

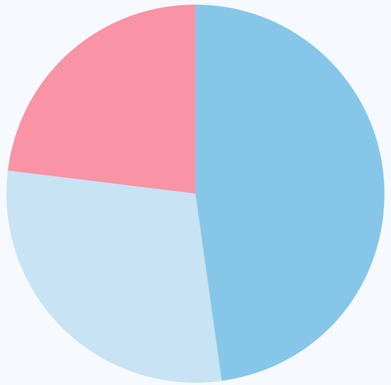
77%

of workers perceive great or moderate improvement in the **health of their household**. This improvement most likely stems from being able to buy more food and pay for medical and hospital bills.



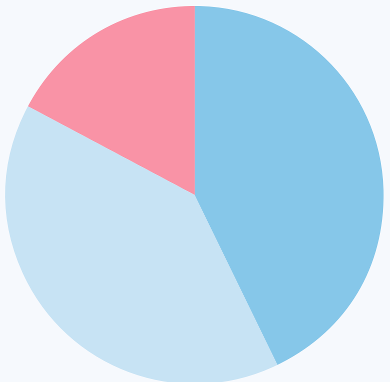
Income

- Great improvements 45%
- Moderate improvements 41%
- No effect 13%



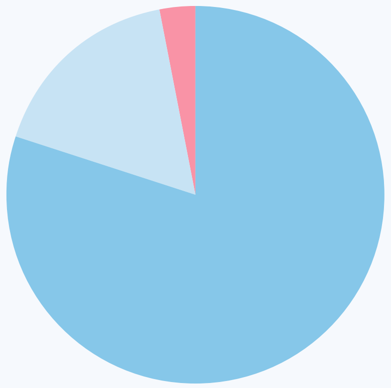
Health

- Great improvements 48%
- Moderate improvements 29%
- No effect 23%



Education

- Great improvements 43%
- Moderate improvements 40%
- No effect 17%



Environmental awareness

- Great improvements 80%
- Moderate improvements 17%
- No effect 3%

A team of Working for Water restorations workers, uMgeni cathment.
Image credit: Maya Paasgard

"I can afford school fees, food and to pay my accounts and clothes. Most people at home do not have a job. Now there is some income coming in. I know first aid, the names of the chemicals and how to use them."

Working for Water employee

2. Socio-economic benefits to people employed on interventions[20]

Benefits to employed workers: lessons from the Berg-Breede catchment

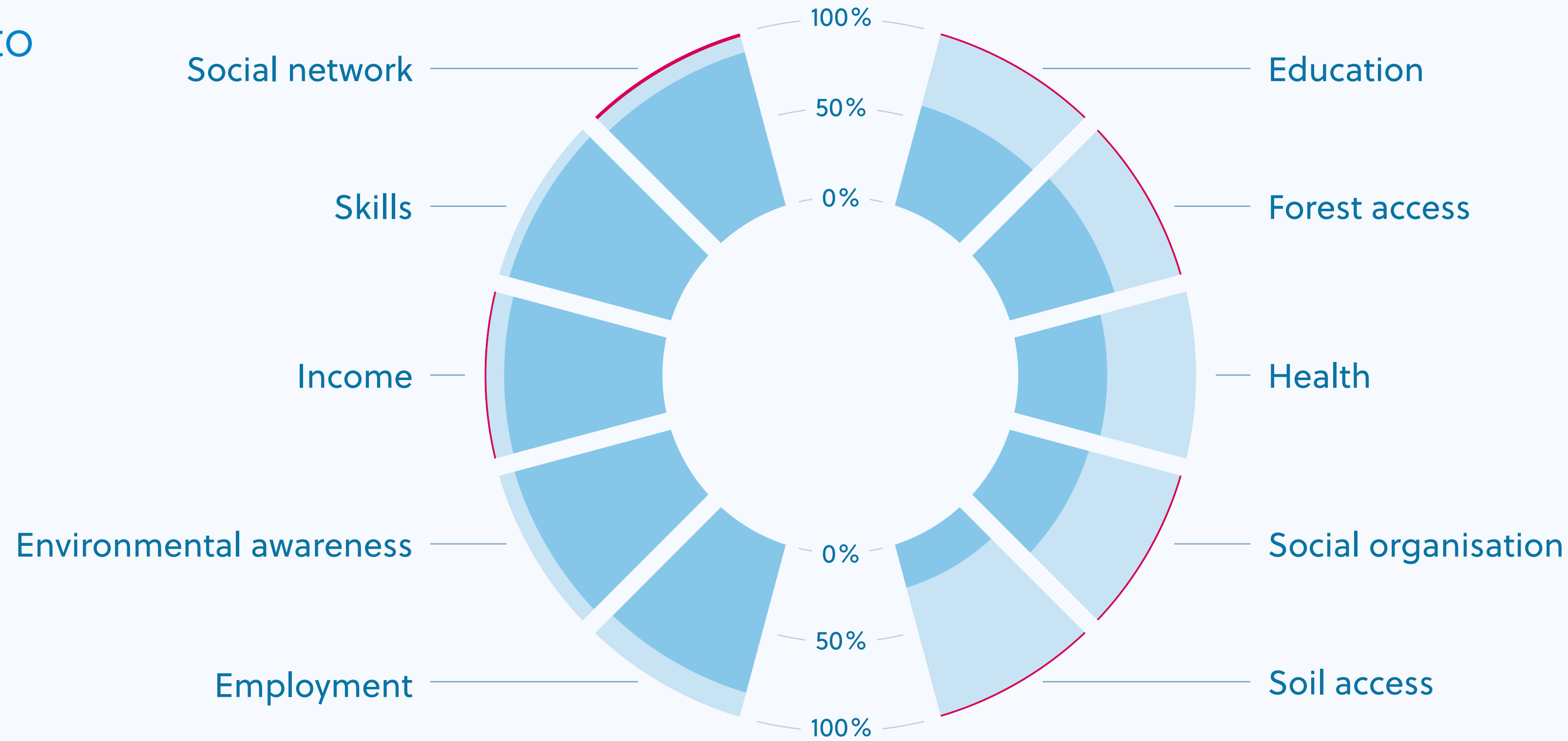
90%

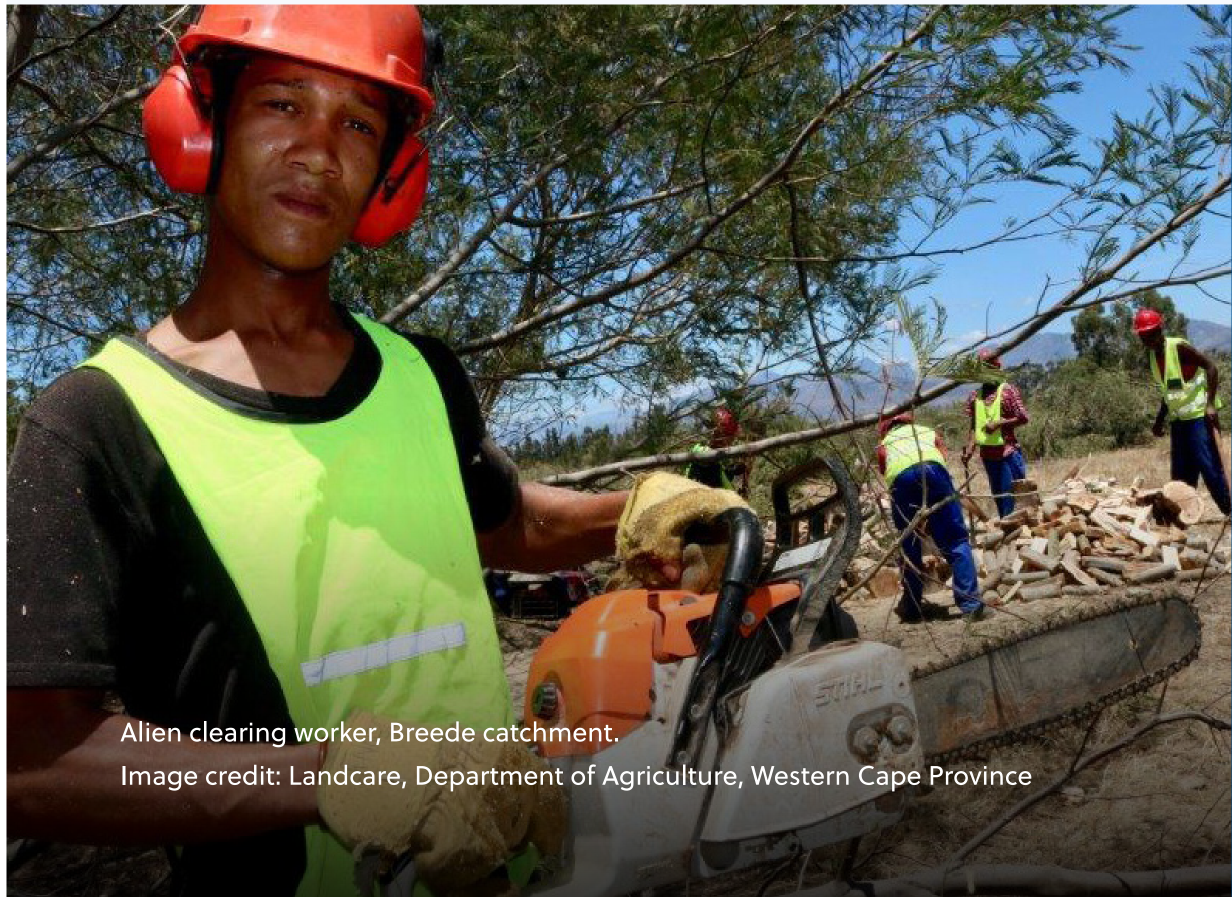
of all respondents perceived their general **skills and competences to be improved** to a great extent due to their involvement in the Ecological Infrastructure project.

65%

of the household's total income is gained from Ecological Infrastructure employment and **supports four other people** besides the employee.

Perceived outcomes due to Ecological Infrastructure





Alien clearing worker, Breede catchment.
Image credit: Landcare, Department of Agriculture, Western Cape Province

"Before I did not have a diploma for this sort of job. Now I can manage a chainsaw and am trained in safety procedures and first aid."

Working on Fire employee

3. Water security and assurance of supply[27]

Clearing invasive alien trees

Return to spectrum of benefits

The MIKE suite of hydrological models was applied to understand and quantify the potential hydrological (water supply) benefits of clearing invasive alien trees in the Upper Berg catchment.

Hydrological modelling was performed for three Ecological Infrastructure scenarios:

Scenario 1. Best case: Successful investment in Ecological Infrastructure, all alien trees cleared to maintenance level.

Scenario 2. Current state of Ecological Infrastructure: Current extent of alien tree invasion - 2019.

Scenario 3. Theoretical case: Equivalent area invaded by alien trees in the riparian zone.

Table 3. A statistical comparison of the simulated streamflow for the three Ecological Infrastructure scenarios

Statistic	Scenario 1	Scenario 2	Scenario 3
	Baseline	Terrestrial Invasion	Riparian Invasion
Total alien tree infestation (%)	0	8.8	8.3
Mean streamflow (m3/s)	4.2	4.2	4.1
Change relative to scenario 1	-	*-0.05*	*-0.11*
% change	-	-1.1	-2.5
Min	0.2	0.2	0.2
Max	100.6	100.6	100.5
Standard Deviation	7.5	7.5	7.5
CV	1.8	1.8	1.8
Average annual volume (Mm3)	133.4	131.9	130.1
Change relative to scenario 1	-	*-1.5*	*-3.4*
Mean annual runoff (mm)	1544	1527	1506
Change relative to scenario 1	-	*-18*	*-39*

1.2%

streamflow gained for clearing ~ 8% of invasive alien trees on **land up slope from the river.**

2.8%

streamflow gained for clearing ~ 8% of invasive alien trees **in and alongside the river.**

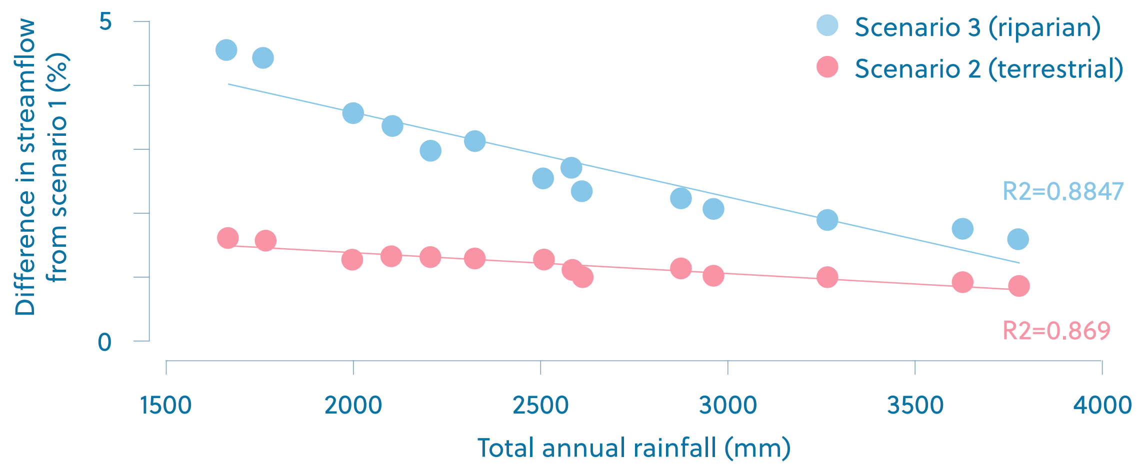


Figure 6. A comparison of the influence which invasive alien tree water use has on streamflow relative to the amount of rainfall received.

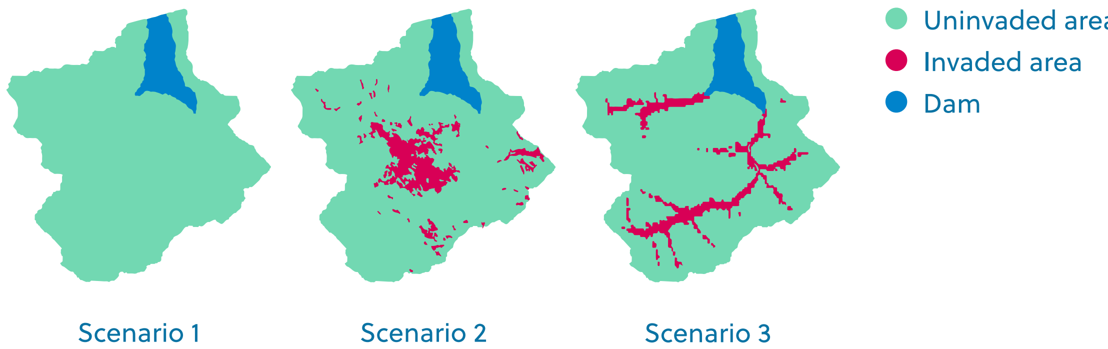


Figure 5. An illustration of the land use land cover classes that were modelled in each of the Ecological Infrastructure scenarios. Invasive alien trees are depicted in red.

3. Water security and assurance of supply[26]

Wetland rehabilitation

The MIKE suite of hydrological models was applied to understand and quantify the potential hydrological benefits (water supply) of wetland rehabilitation activities in the Lions River wetland, as well as the Mkabela catchment.

Hydrological modelling was performed for two scenarios:

Scenario 1. Present wetland condition i.e. with artificial drainage (before conservation, restoration and rehabilitation).

Scenario 2. Potential future wetland condition i.e. without artificial drainage (after conservation, restoration and rehabilitation).

The purpose of the simulations and the subsequent evaluations was to demonstrate how rehabilitation efforts may improve the localised delivery of hydrological ecosystem services and prevent further degradation of the system's ability to optimally deliver hydrological ecosystem services in the future.

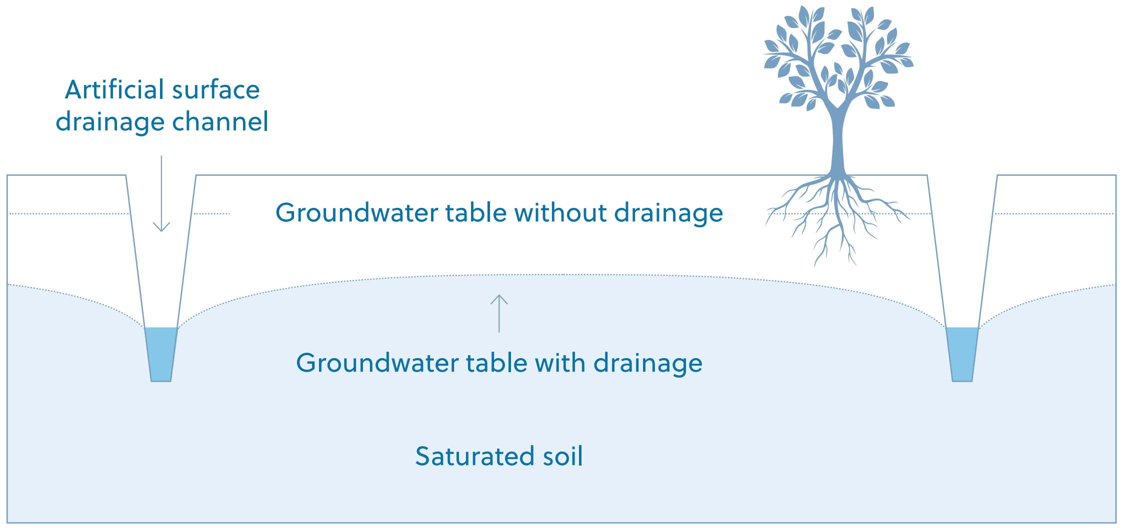


Figure 7. Conceptual representation of the influence which artificial surface drainage has on groundwater water table levels (adapted from Gurovich and Oyarce, 2015).

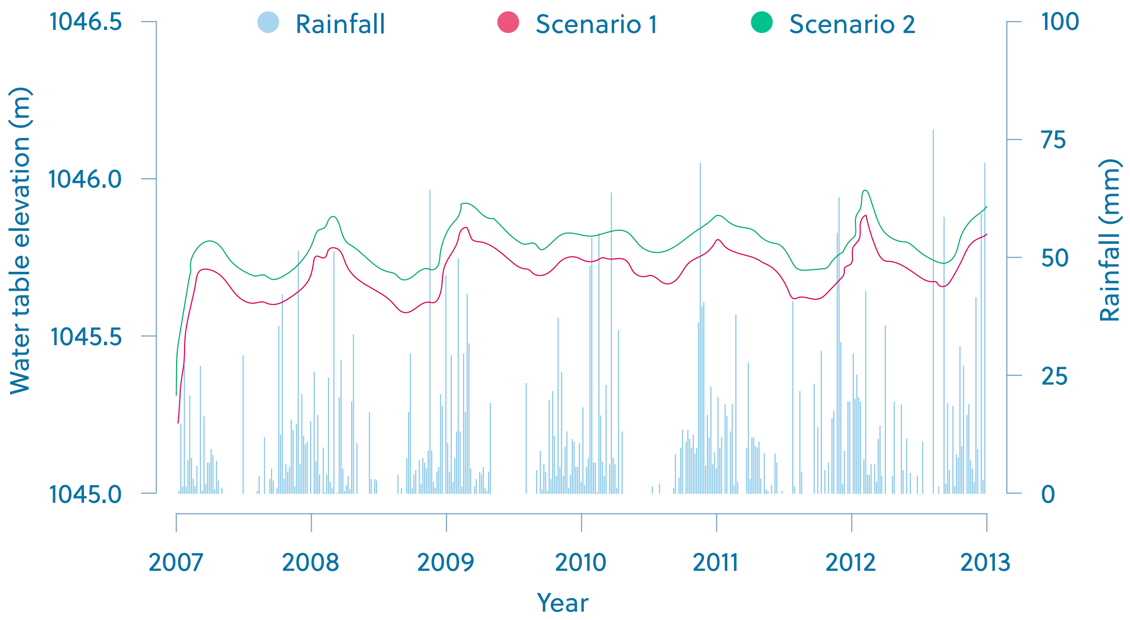


Figure 8. Time series comparison of average daily water table elevation (WTE) levels for the Lions River wetland.

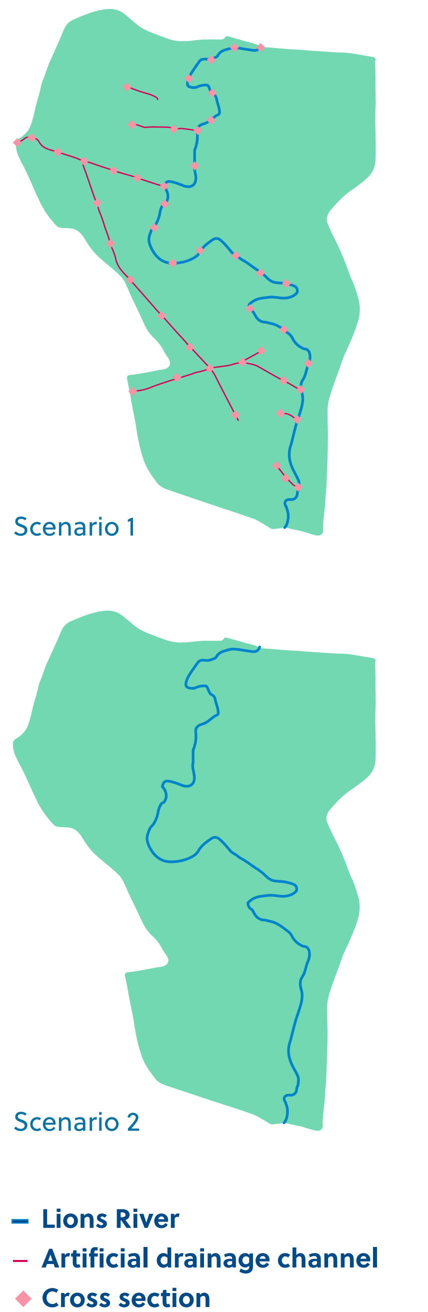


Figure 9. Delineation of the Lions River channel, artificial drainage channels and cross-sections within.

In general, the results of these investigations demonstrated that the removal of artificial drains from the wetland can aid in:

Increasing water table levels

Increasing streamflow

Allowing the wetland to stay wetter for longer

Return to spectrum of benefits

9. Builds resilience to climate change[29]

Reducing hydroclimatic risk due to human-caused climate change: Southwestern Cape drought (2015-2017)

17%

drought-period streamflow lost due to human-caused climate change (climate change).

14%

additional streamflow could have been lost due to climate change if the Upper Berg was fully invaded with invasive alien trees.

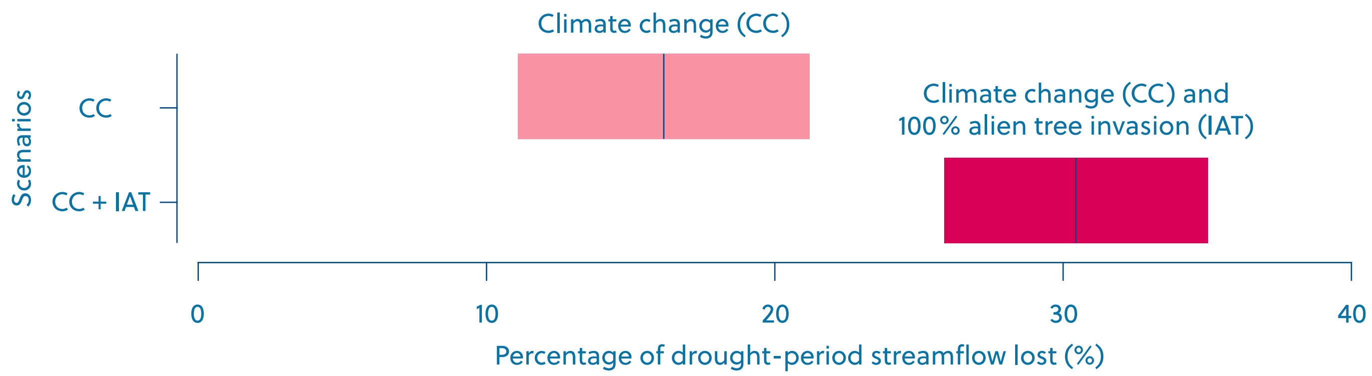


Figure 10. The percentage of drought-period streamflow lost due to human-caused climate change (climate change) and the potential avoided impact of alien tree invasion in escalating these losses. This graph shows modelled results for drought-period streamflow for the Upper Berg as we experienced the drought with climate change relative to a world without climate change.

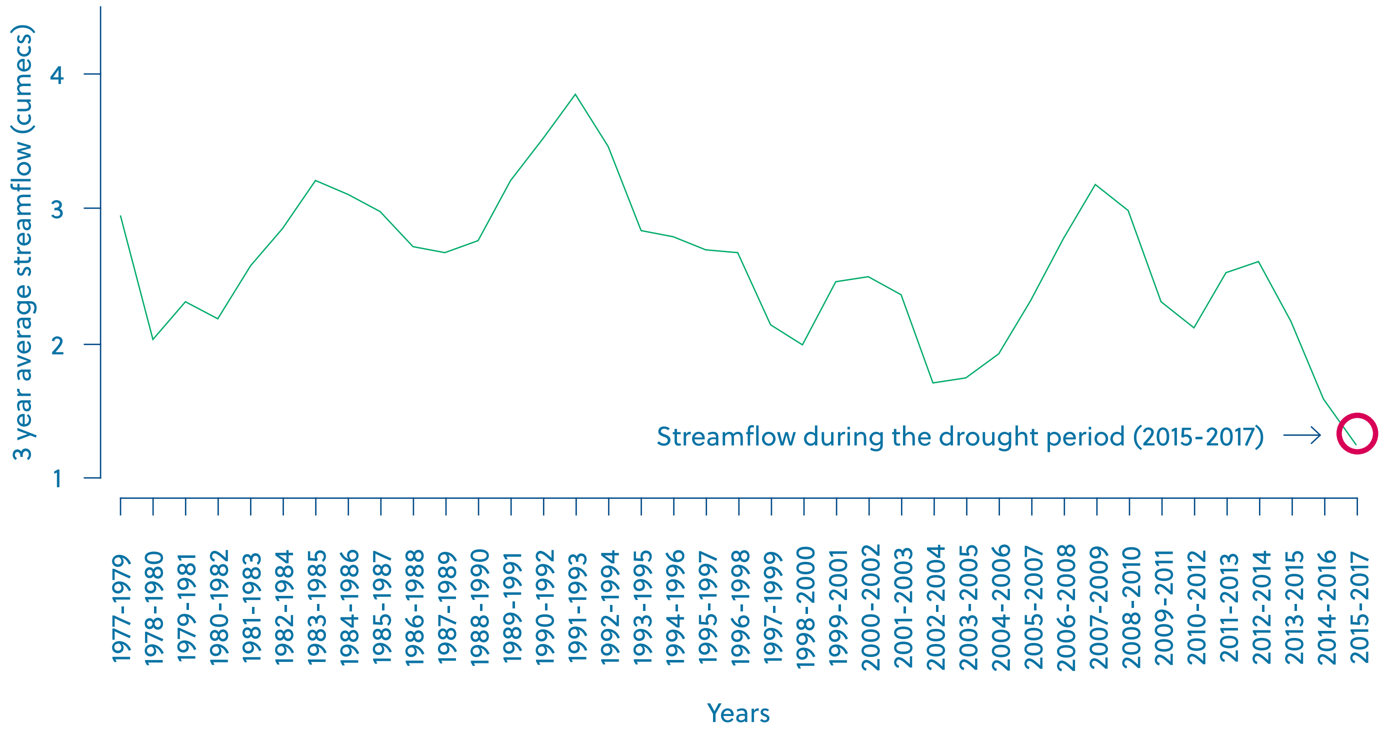
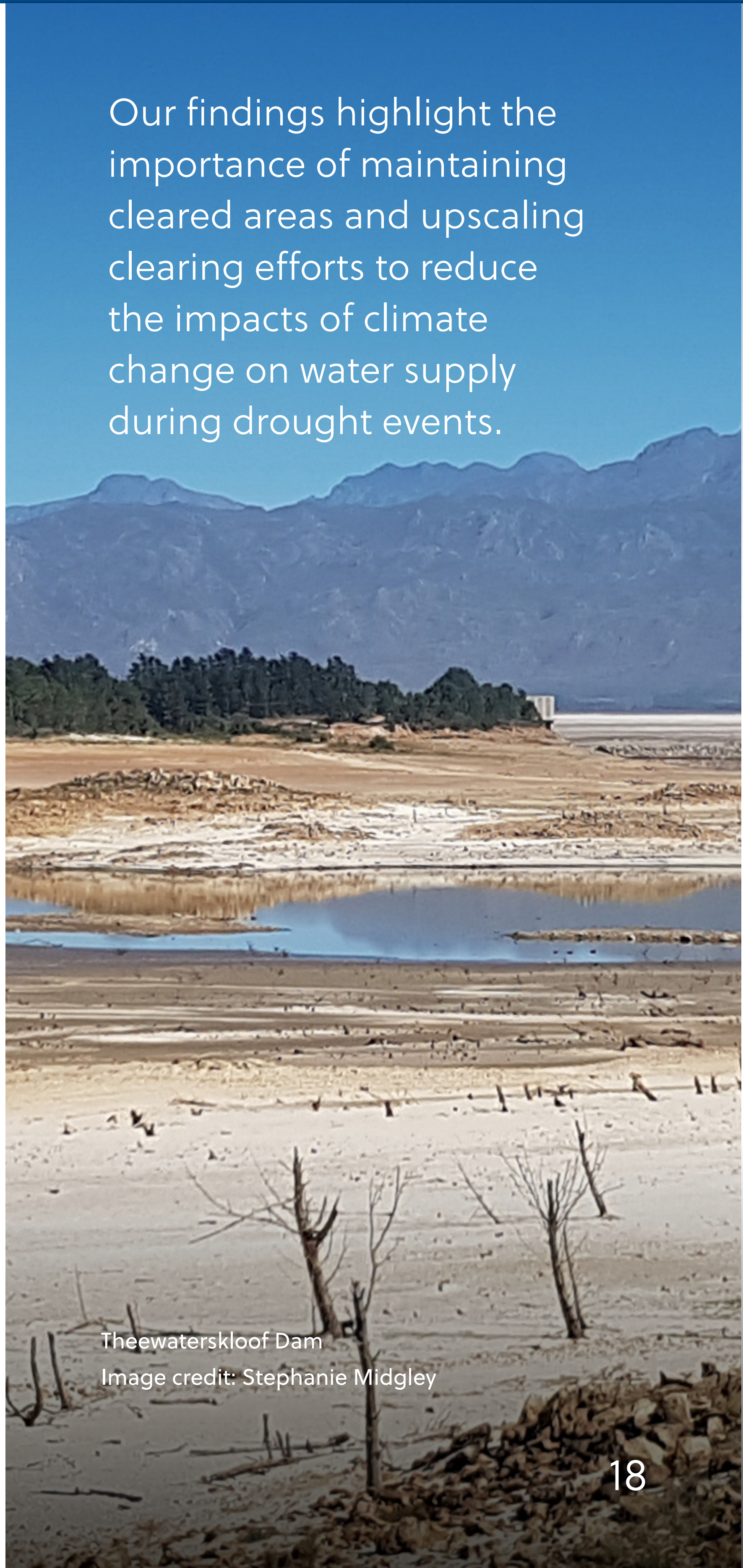


Figure 11. The drought years (2015-2017) had the lowest streamflow (drought-period streamflow) recorded over the last ~40 years in the Upper Berg subcatchment situated in the Berg catchment.

Our findings highlight the importance of maintaining cleared areas and upscaling clearing efforts to reduce the impacts of climate change on water supply during drought events.



Theewaterskloof Dam
Image credit: Stephanie Midgley

12. Financial return on investment[41]

Clearing invasive alien trees

The Upper Berg and Wolwekloof sub-quaternary catchments are a priority for invasive alien tree clearing with a total of 689 ha of 100% density pine trees.

R49m

estimated cost to clear and maintain the catchment.

R88m

estimated value of water saved.

6.9%

nominal return per year over 20 years.

Table 4. The estimated costs and financial benefits of clearing invasive alien trees in the Upper Berg and Wolwekloof sub-quaternary catchments.

	Total invasion	Riparian areas	Steep slope and high-altitude areas	Other terrestrial areas
Cost to clear (Rm)	**49.1**	4.9	21.4	22.8
Value of water saved (Rm)	**88.0**	7.1	13.6	67.3
Net benefit (Rm)	**38.9**	2.2	-7.8	44.5
% on cost	**79.2**	44.9	-36.4	195.2
			It may not be feasible for investors looking for direct financial returns to clear steep slope and high-altitude areas.	

Table 5. The estimates in Table 4 could support the establishment of a bond that would pay financial returns. Return on investment is in nominal terms.

Maturation period (years)	10	15	20
Bond size (Rm)	44.5	62.5	80.5
Annual return on investment (%)	0.00	4.38	6.90

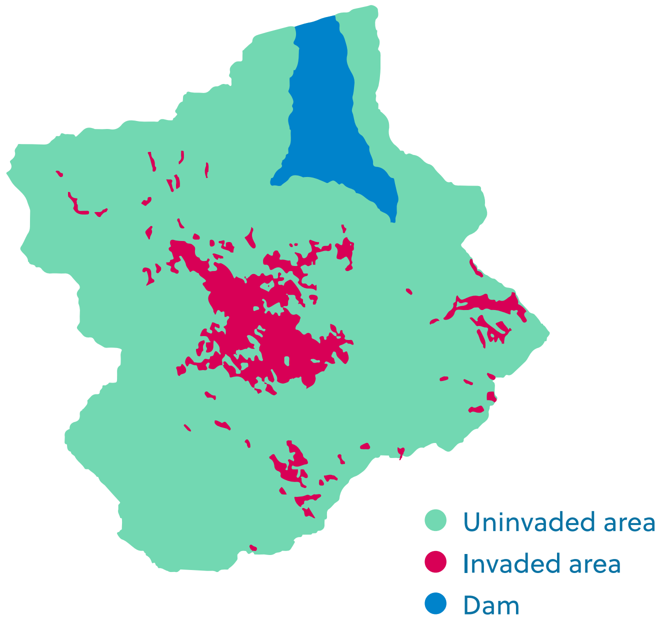


Figure 12. Invaded areas of the Upper Berg and Wolwekloof sub-quaternary catchments

Table 6. Hectares (ha) of invaded area in the Upper Berg and Wolwekloof sub-quaternary catchments.

	Area invaded (ha)
Riparian	35
High altitude	147
Other	506
Total	**689**

15. B-BBEE scorecard points

Corporate Social Investment

Corporate Social Investment (CSI) contributions towards Ecological Infrastructure interventions that facilitate sustainable access to the economy can be used to earn Socio-Economic Development (SED) points on a Broad-Based Black Economic Empowerment (B-BBEE) scorecard.

An example of a successful CSI project that invests in Ecological Infrastructure is AECI's Wise Wayz Water Care (WWWC) initiative, into which AECI has donated over R15 million since 2016:

- Based in the lower Mbokodweni catchment area in eThekwini, Kwa-Zulu Natal
- Supports volunteers with skills and equipment to perform Ecological Infrastructure interventions
- Provides environmental benefits such as cleaner water and reduced invasive alien plants
- Provides socio-economic benefits to volunteers and the broader communities such as business development skills, environmental education, and reduced health risks
- Provides a range of benefits to AECI, including cleaner water at their Umbogintwini Industrial Complex water abstraction site, SED points for their B-BBEE scorecard and marketing their commitment to sustainability

Media coverage

This project generated over 1 million viewership with a monetary value of R600 000 in media coverage in 2018.

Collaboration

This project resulted in multiple collaboration with other tenants on the AECI Group Industrial complex and surrounding areas.

This has also strengthened partnerships with these stakeholders.

AECI bigger values

Going green
Responsible
Innovation

AECI good chemistry

Recognition

AECI Group was able to leverage the support provided as B-BBEE benefit for ownership.

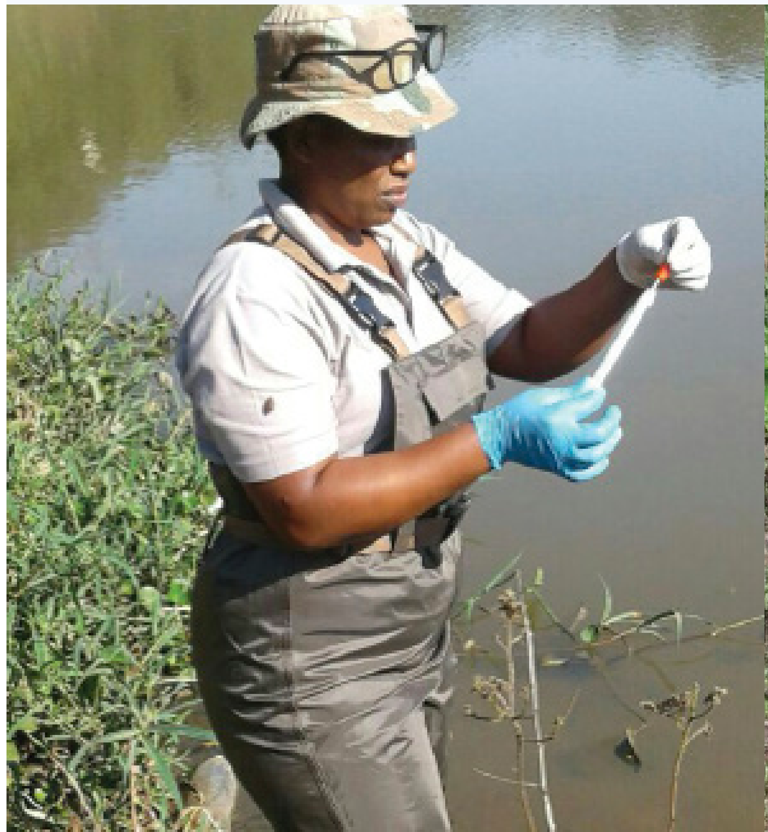
AECI was recognised for the following awards in 2018 for the WWWC projects:

Gender Mainstreaming Awards
Mail and Guardian Awards
Trialogue Awards

Environmental

Improved water quality in the AECI Industrial complex.

Reduced environmental complaints.



Financial and other opportunities for private sector investment

The diverse set of economic, social and environmental benefits arising from Ecological Infrastructure interventions will appeal to different private sector investors in varied ways.

Institutional investors such as banks and asset managers will be most interested in financial returns, where these can be generated. In some cases, novel investment instruments might need to be used, such as blended finance or resilience bonds.

However, many private sector investors can also benefit directly and indirectly from the risk reduction that improved Ecological Infrastructure delivers to their core business:

- Insurance companies may benefit from interventions that reduce the risk of events that would trigger pay-outs, such as business interruption from water restriction, flooding, as well as fire risk.
- Asset managers generally have some portion of their investments in companies or assets that depend on well-functioning Ecological Infrastructure to secure assurance of water supply, systemic disaster risk reduction, and overall reduced operating risks.
- Banks generally lend capital to landowners and companies that depend in similar ways on well-functioning Ecological Infrastructure.

These investors can also garner reputational benefit by preferentially investing in the "Green Economy" as the corporate world becomes increasingly scrutinised with respect to environmental sustainability.

To pique the interest of private investors this brief presented a matrix of investor types and the benefits, indicating which benefits the different investor types might find valuable, so that tailored investment cases per investor type can be developed (**Table 1**). These benefits have been substantiated by evidence-based research outputs from the SEBEI project, as well as other research (**see page 14 to 20**).

A significant constraint to raising private sector finance, especially the upfront capital needed for initial restoration, is that the rates of financial return that can be generated from Ecological Infrastructure interventions are generally much lower than the desired rate of return for traditional investors. However, the diverse motivations for investing in Ecological Infrastructure and the varying financial return on investment required by different investor types, allows for tailored financial mechanisms to be developed, such as blended finance models (**Box 1**) and green (or similar) bonds (**Box 2**).

Wetlands are ecological infrastructure which provides many important ecosystem services to society, including water purification, carbon sequestration and biodiversity enhancement. Pictured is a pristine wetland in the grasslands of the uMngeni, KwaZulu-Natal.

Image credit: Alanna Rebelo

Box 1: Blended finance enabling private-sector investment

Blended finance is the strategic use of public sector financial resources, development finance, grants and/or philanthropic funds, to mobilise or leverage private capital that require a return on investment higher than can easily be generated for a given project.

With funding from these sources, which are provided under less favourable conditions (lower return, higher risk, longer tenure), a financial mechanism can be established that allows the private sector to capitalise on the potential returns while benefiting from valuable downside risk protection, thereby enhancing the investment case.

Internationally, several facilities and initiatives have been established to play a catalysing role in mobilising private-sector capital. An example is WWF's Bankable Projects initiative.[d] The initiative aims to direct development and philanthropic funding to the 'un-fundable' aspects of Ecological Infrastructure interventions and to raise seed capital to take bankable projects from a concept or idea to a pre-feasibility phase, after which private sector capital seeking a financial return is targeted.

In South Africa, the Development Bank of Southern Africa has established two facilities aimed at providing catalytic finance: The Climate Finance Facility (CFF) and the Green Fund. The CFF aims to increase climate-related investments in Southern Africa by co-funding and de-risking projects and businesses that mitigate or adapt to climate change to crowd-in significant investments from the private sector. Similarly, the Green Fund aims to provide seed funding and other support at the early stages, when the risks are too high for private sector investment.

Box 2: Bonds for investment in Ecological Infrastructure

Bonds, especially green and water bonds, have received considerable international attention as a means of attracting private capital for Ecological Infrastructure interventions. They can be issued by governments, banks, municipalities, or corporations. Bonds are perceived to be lower risk for investors due to their fixed period, fixed investment mandate, agreed-upon rate of return and, in some instances, government underwriting.

Bond payments to investors can be generated in several different ways:

1. A project might generate a sufficient return to fully finance the repayments.
2. Where projects do not generate a sufficient return, the repayment can be subsidised by other sources of the entity issuing the bond, such as general operations budget or other income streams.
3. Alternatively, the bond issuer contracts with implementing entities that payments will be made to them once certain investment criteria are met (so called "pay for performance" bonds). If the criteria are not met, the bond capital remains unused, and can cover the bond repayment.

An international example of an Ecological Infrastructure bond relevant to the South African context is the California Forest Resilience Bond[e], which finances "forest thinning" to reduce wildfire risk and enhance water resource reliability. The main beneficiaries of forest thinning were identified, and encouraged to invest in the bond, with the aim of sharing the cost of the activity among all the beneficiaries rather than putting the burden purely on the forestry department (as has been the situation historically). This is a "pay for performance bond", where the aims of the project are co-identified with the beneficiaries and metrics (or parameters) of success are determined. The beneficiaries sign contracts stating that they will pay a certain amount should the project meet its predetermined metrics of success. The amount these beneficiaries agree to pay for success is generally equivalent to the cost savings or additional revenue they stand to receive from forest thinning. A governing entity then goes to the market to raise capital from the private sector on the back of these contracts. The proceeds are used to implement the project and, should it result in the metrics of success being met, the beneficiaries make their obligated payments to the entity who then structures the payments as cash flows to investors. This form of bond is appealing in South Africa as there are many beneficiaries from Ecological Infrastructure interventions that are not contributing to the cost of implementing interventions.

Conclusion

The research presented in this brief has shown that investment in Ecological Infrastructure interventions in critical water source catchments in South Africa can contribute to water security, build wider socio-economic resilience, and generate jobs and secondary social benefits for low-skilled workers and their families.

The financial resourcing needed to invest at large scale in Ecological Infrastructure is orders of magnitude larger than current investments through national and local government. Therefore, private sector finance will be necessary for expanding the scale of Ecological Infrastructure investments in South Africa so that the full potential of water-related social and economic benefits can be reached. Up to now, there has been scepticism about the ability of Ecological Infrastructure investment instruments to generate financial returns attractive to the private sector.

In some instances, an attractive financial return on investments can be achieved, especially if the investment is made over longer time periods of ten years or more. Alternatively, some investors are willing to receive a lower financial return in exchange for a positive social or environmental impact.

New financial instruments are emerging internationally that could be used in South Africa to attract private sector finance, including "pay for performance" green bonds, which can attract investment from diverse beneficiaries across the private sector.

Rehabilitation
Image credit: Landcare, Department of Agriculture, Western Cape Province

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Notes

a. It was estimated that R270 million is needed for the uMngeni River catchment (Pringle et al., 2016) and R370 million is needed for important catchments in the greater Cape Town region (TNC, 2018). Pringle, C., Bredin, I., McCosh, J., Dini, J., Zunckel, K., Jewitt, G., Hughes, C., de Winnaar, G. and Mander, M., 2015. An investment plan for securing ecological infrastructure to enhance water security in the uMngeni River Catchment. Development Bank of Southern Africa, Midrand.

b. An example is the alien and invasive species regulations of the National Environmental Management: Biodiversity Act (Act 10 of 2004, or NEMBA).

c. Examples include the Biodiversity & Wine Initiative (BWI) and the Integrated Production of Wine (IPW) certification schemes.

d. For more information visit **wwf.panda.org/discover/our_focus/freshwater_practice/bankable_projects**

e. For more information about the bond visit **www.usda.gov/media/blog/2020/07/09/innovative-finance-model-accelerates-forest-restoration**

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www.acdi.uct.ac.za/socio-economic-benefits-ecological-infrastructure-sebei

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