GREATER CAPE TOWN WATER FUND

BUSINESS CASE | **SUMMARY OF FINDINGS** | AUGUST 2019

The Nature Conservancy

WaterFunds for Africa

INTRODUCTION

Water security is a major concern globally and increasingly so in parts of the world where supply is not able to meet demand because of climatic or human pressures, or both. Nowhere is this more true than for the Greater Cape Town Region, South Africa, where the City of Cape Town faced the possibility of running out of water following a three-year drought between 2015 and 2018 — which would have been a global first for as large a city. Not only did the drought impact urban water users, it also had significant economic and social consequences for the tourism and agricultural sectors.

The Business Case puts forward ecological infrastructure restoration as a critical component of efforts to enhance water security for all users of the Western Cape Water Supply System (WCWSS) (Figure 1).

Analysis demonstrates that the restoration of priority sub-catchments through the removal of alien plant invasions will generate expected annual water gains of 55 billion liters (55 Mm^3) within six years compared to the business as usual scenario — equivalent to one-sixth of the city's current supply needs. These annual gains double to 100 billion liters (100 Mm^3) within 30 years. Catchment restoration is significantly more cost-effective than other water augmentation solutions, supplying water at one-tenth the unit cost of these alternative options.

Funding and coordination of restoration efforts will be overseen by a collective action Water Fund that pools investment across multiple public and private water users.

This document summarises the findings of the Greater Cape Town Water Fund Business Case.[1]

1. nature.org/cape-town-water

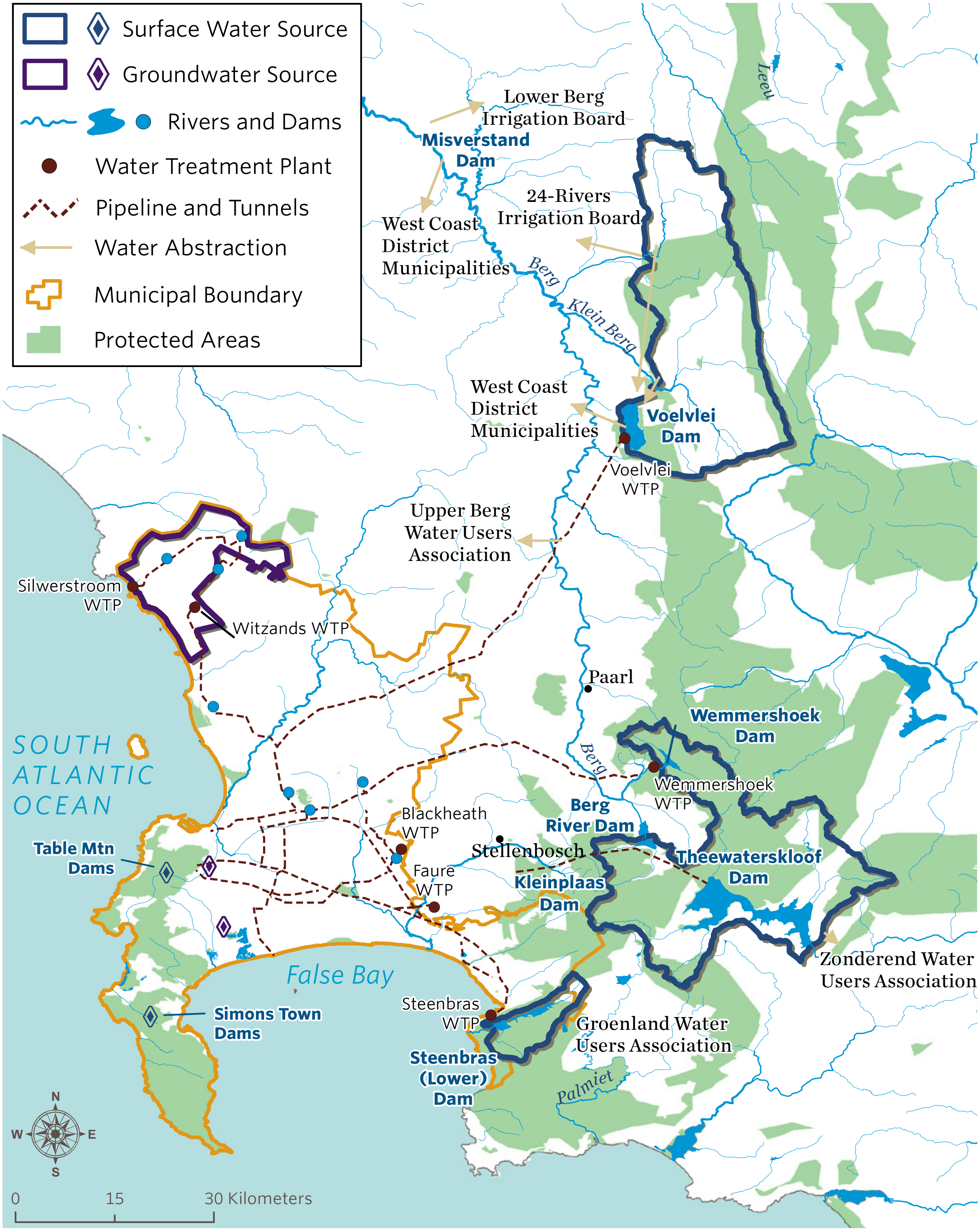


Figure 1. Western Cape Water Supply System users include the Cape Town metropolitan area, the agricultural sector, and smaller municipalities and communities.

AVOIDING DAY ZERO

At the height of the water crisis in early 2018, dam levels dropped below 20% and Cape Town prepared for the day when the taps would run dry, dubbed "Day Zero". Day Zero was narrowly avoided due to adherence to short-term water use restrictions, a cut in irrigation water to agriculture, and additional water pumped in from a neighbouring scheme. However, the threat remains. Cape Town's population is growing fast, at a rate of about 2.6% a year, while water supply has flatlined (Figure 2). Climate models show decreased rainfall accompanied with increased temperatures in the future, increasing the risk of water shortages.

Water demand is predicted to outstrip current supply in the Greater Cape Town Region by 2021.

This could have dire consequences for Cape Town, the agricultural sector, and neighbouring municipalities who all depend on this water source. The recent drought cost more than 30,000 agricultural jobs in areas serviced by the Western Cape Water Supply System and negatively impacted the tourism industry, bringing the importance of water security to the forefront.

The City of Cape Town has had remarkable success coping through demand management schemes, including public outreach and the reduction in losses due to leaks, but current forecasts suggest that an additional 300-350 million liters of water a day will be needed by 2028 to ensure supply meets demand.

More than R8 billion ($540 million USD) in public funding is being considered for augmenting water supply through investments in deep aquifer drilling, desalination, water reuse and increased surface water storage to meet the required demand.

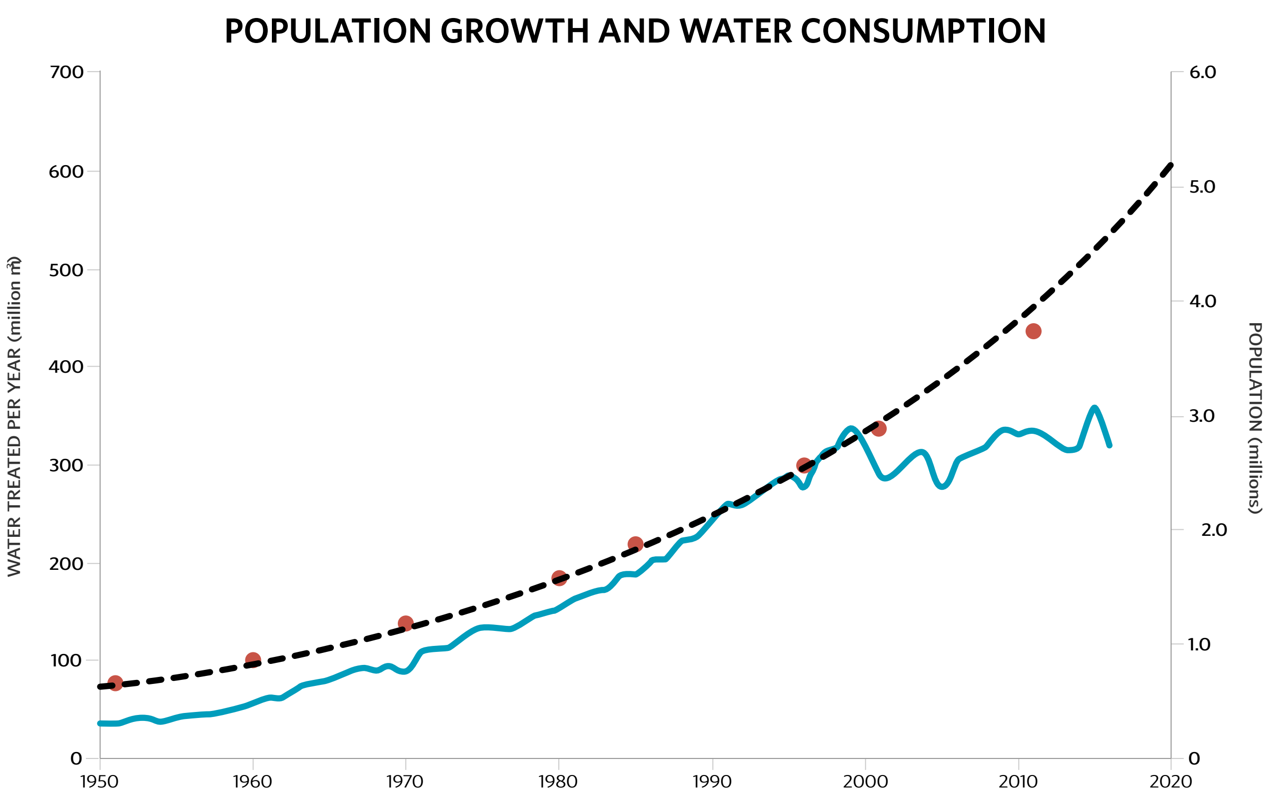


Figure 2. The population is growing while water consumption has flatlined.[2]

2. Figure adapted from City of Cape Town

THE CASE FOR ECOLOGICAL INFRASTRUCTURE

While until recently the focus has been on grey, or built, infrastructure solutions to combat water scarcity, there is another more cost-effective option with the potential to augment water supply. Long-term water security in the Greater Cape Town Region, as elsewhere, begins at the source with the ecological infrastructure (native vegetation, wetlands, etc.) that regulates source water quality and supply. Healthy catchments naturally store, filter, and transport rainfall to rivers and dams.

The state of many of the source water sub-catchments feeding the WCWSS is being heavily degraded by invasive alien plants. These trees quickly replace native species if unmanaged and threaten the diversity of native plant life in the Cape Floral Kingdom, where 70% of plants are found nowhere else on the planet. Invasive alien plants alter soil ecology, increase the frequency and severity of wildfires, and significantly impact river flow and aquifer recharge.

Thirsty invasive alien plants, including Australian acacias, pines and eucalyptus, have roots that extend deep into the soil and use up to 20% more water per hectare than the region's native fynbos vegetation.

They have increased evapotranspiration rates because they are taller and have a larger leaf surface area than native species. The growth of many native species is water limited during dry periods, while invasive plants such as Australian black wattle have extensive rooting systems which allow them to access groundwater and keep growing, even during drought.

These alien plant invasions in the main water source areas of the WCWSS reduce the amount of water that reaches the rivers and dams that feed the region, resulting in a loss of an estimated 55 billion liters of water (55 Mm^3) a year. That is the equivalent of nearly two months of Cape Town's annual water supply. In a region where every drop of water counts, these losses are significant.

In response, a coalition of partners including The Nature Conservancy, National Department of Water and Sanitation, National Department of Environmental Affairs (Environmental Programmes), Provincial Department of Environmental Affairs and Development Planning, City of Cape Town, SANBI, CapeNature, Coca-Cola Peninsula Beverages, Nedbank, Remgro Ltd, and WWF, came together under the auspices of the Greater Cape Town Water Fund Steering Committee.

The Committee commissioned studies to evaluate the impact of nature-based solutions, beginning with targeted removals of alien plant invasions, on water supply, and determine whether investing at scale in ecological infrastructure restoration is in fact cost competitive with other supply-side solutions.

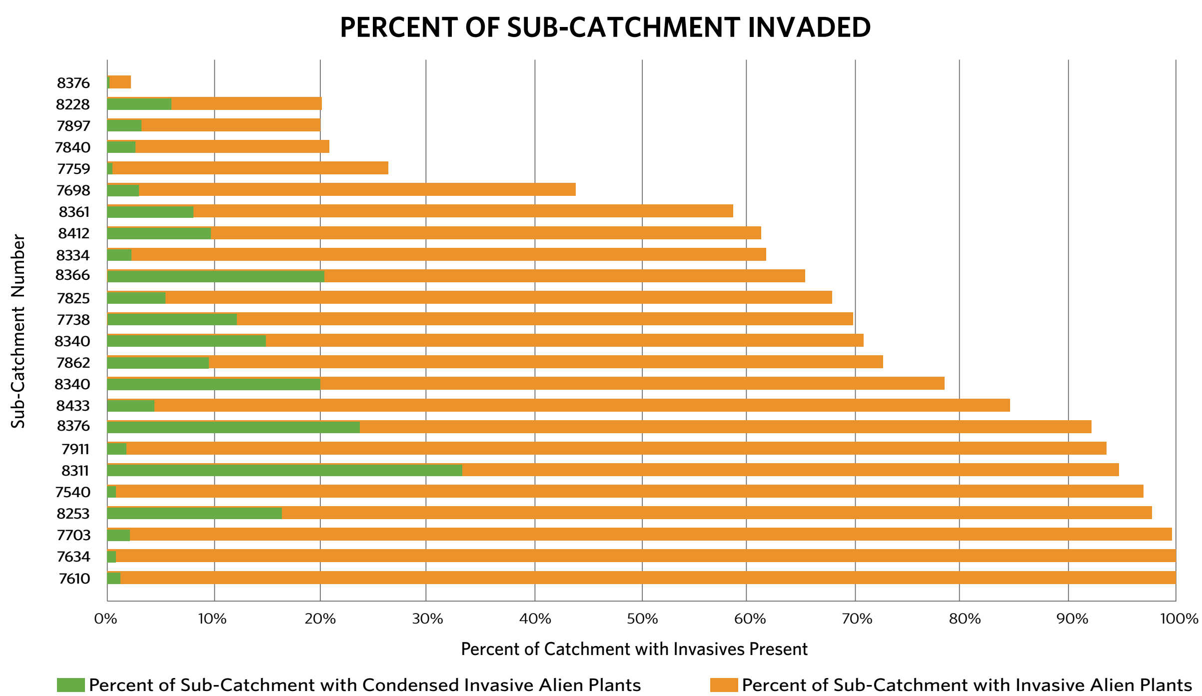


Figure 3. Invasive alien plant coverage of sub-catchments, showing percentage of land where invasive plants are present and the percentage of hectares with condensed invasives.

BUSINESS CASE ANALYSIS AND RESULTS

The studies build on a rich body of data on the costs and operational needs for effective invasive alien plant removal, based on longstanding programmes in South Africa, such as Working for Water.

Combined with detailed scientific evidence on the quantities of water used by these plants, a robust foundation is in place to evaluate an investment decision around the impact of controlling invasive alien plants in the water source areas of the WCWSS. The business case analysis models a 30-year period, discounting both costs and water gains at 6% for surface water sub-catchments.

A six-step process was followed to identify priority source water sub-catchments for invasive alien plant removal and to understand the return on investment associated with implementing these interventions at scale:

STEP 1

Mapping the current extent of alien plant invasion

Factors contributing to sub-catchment degradation include agriculture, forestry plantations, and invasive alien plants. A spatial analysis revealed widespread alien plant infestation across over two-thirds (69%) of the 25 source water sub-catchments in the WCWSS, with 14,400 hectares (10%) of that area suffering severe degradation through dense invasion.

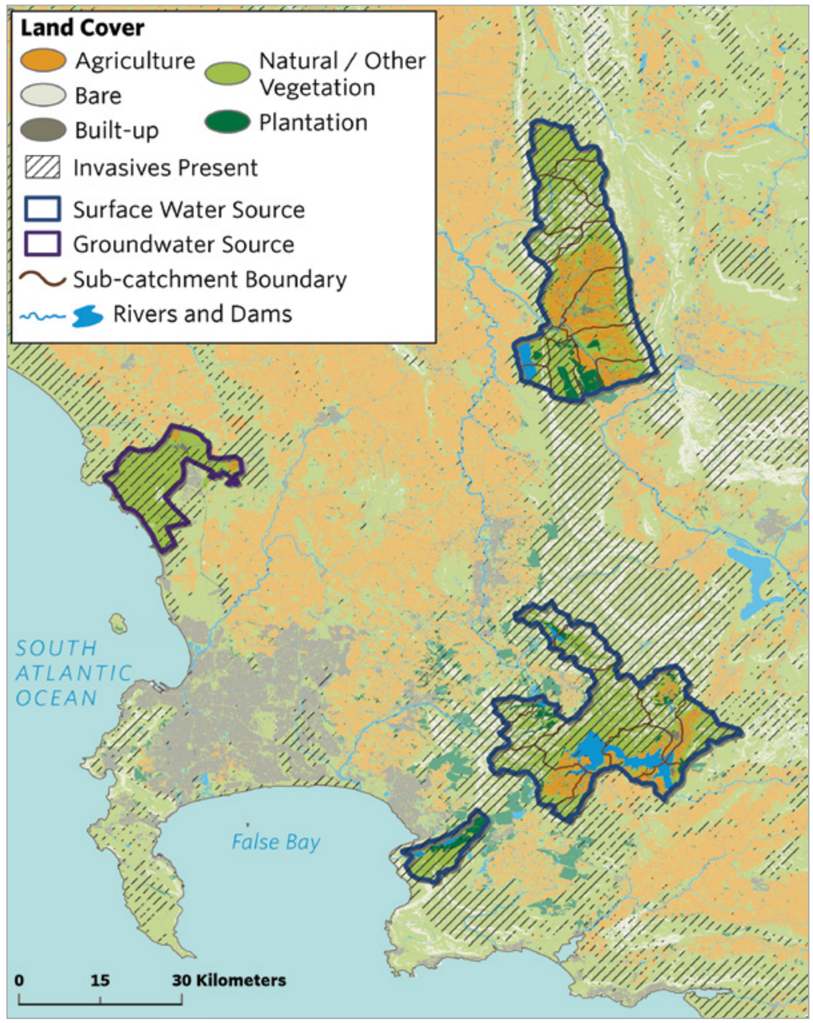
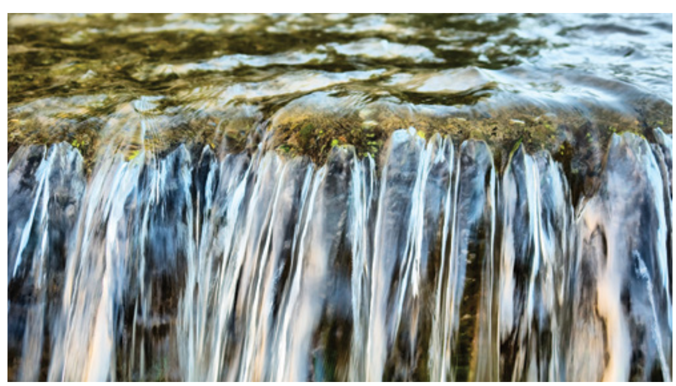
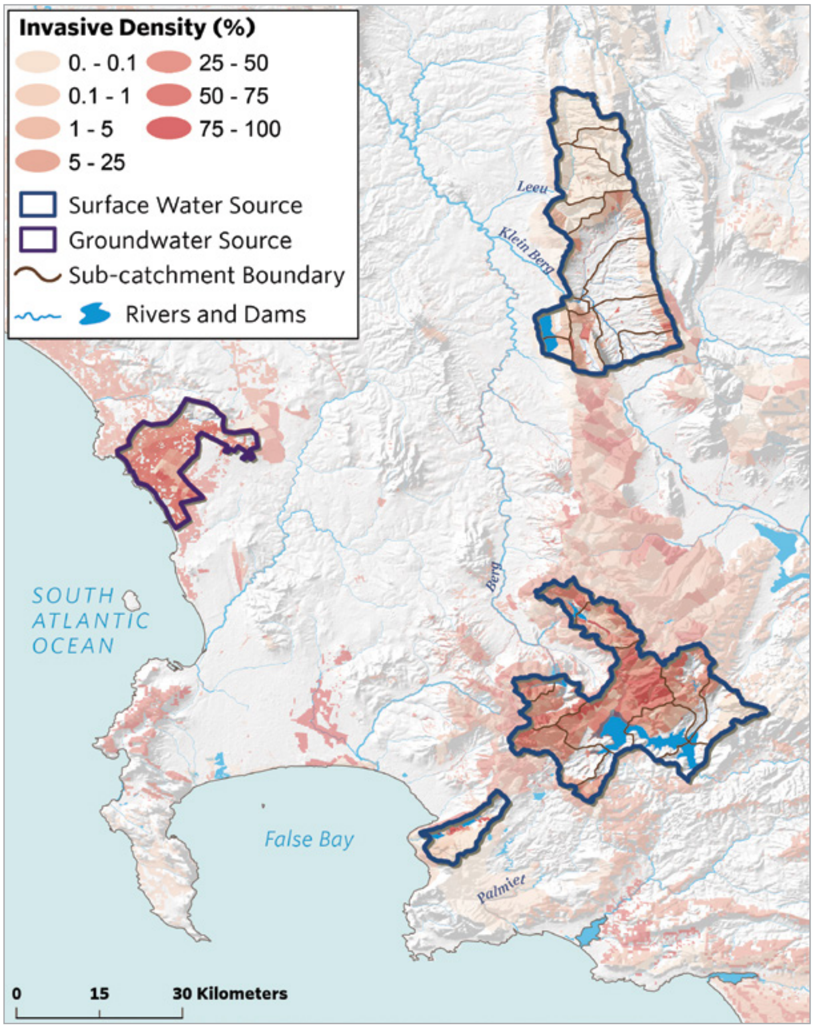


Figure 4. Over two-thirds of sub-catchments are invaded by alien plants.





STEP 2

Modeling current and future water loss due to alien plant invasion

A spatial analysis was conducted to estimate the reduction in run-off resulting from alien plant invasions in each of the WCWSS sub-catchments that supply the major dams: Wemmershoek, Theewaterskloof Berg River, Steenbras, and Voëlvlei. A reservoir model (ResSim) was used to estimate the resulting reduction in dam yields.

Total current water yield reduction due to alien plant invasion is estimated at 55 billion liters (55 Mm^3) per year — equivalent to a two month supply — and is predicted to more than double in the next 30 years given projected expansion of alien plant invasions under a no intervention scenario.

Figure 5. Invasive alien plant density distribution across the sub-catchments.

STEP 3

Estimating the costs per hectare of invasive alien plant control based on local conditions

A detailed breakdown of capital and operational costs for removal and subsequent long-term control of invasive alien plants was carried out for each sub-catchment, which took into account local conditions such as terrain and road access, as well as the extent of invasion and the type of species involved (Figure 6). Initial control operations are the most costly, up to R40,000 ($2,700 USD) per hectare in very dense invasions in rugged terrain and riparian areas. Thereafter the cost gradually declines over time as invasive plant density and size decreases following each intervention.

ENVIRONMENT			OPERATIONAL	MANAGEMENT
GEOGRAPHIC AREAS	SPECIES	ENVIRONMENT	TEAM	MANAGEMENT
• Map showing the area to be cleared	• Type of species • Density of invasion • Size of invasive trees to be cleared • Herbicides	• Slope of the area to be cleared • Distance from access point • Accessability – difficulty factor influencing time it will take to complete a project	• Wages • Protective Clothing • Transport • Overheads	• Project oversight • Administration • Monitoring and Evaluation • Transport • Overheads

Figure 6. Factors affecting total investment required in invasive alien plant removal.

STEP 4

Ranking areas by highest ROI

Sub-catchments were ranked in terms of their return on investment (ROI); that is, the number of cubic meters of water generated per rand invested in invasive plant removal over a 30-year period.

Seven of the 25 sub-catchments were identified as priorities for invasive alien plant removal.

Those seven sub-catchments comprise a total of 54,300 hectares, and are the sub-catchments for Wemmershoek, Theewaterskloof, and Berg River dams — which supply 73% of the surface water contribution to the WCWSS. Catchment restoration here will deliver the highest ROI and lowest unit reference value (URV). Unit reference value expresses the cost of each cubic meter (m^3) of water supplied by an intervention. The priority sub-catchments have a low combined average URV of R1.2 per m^3, which includes water treatment cost.

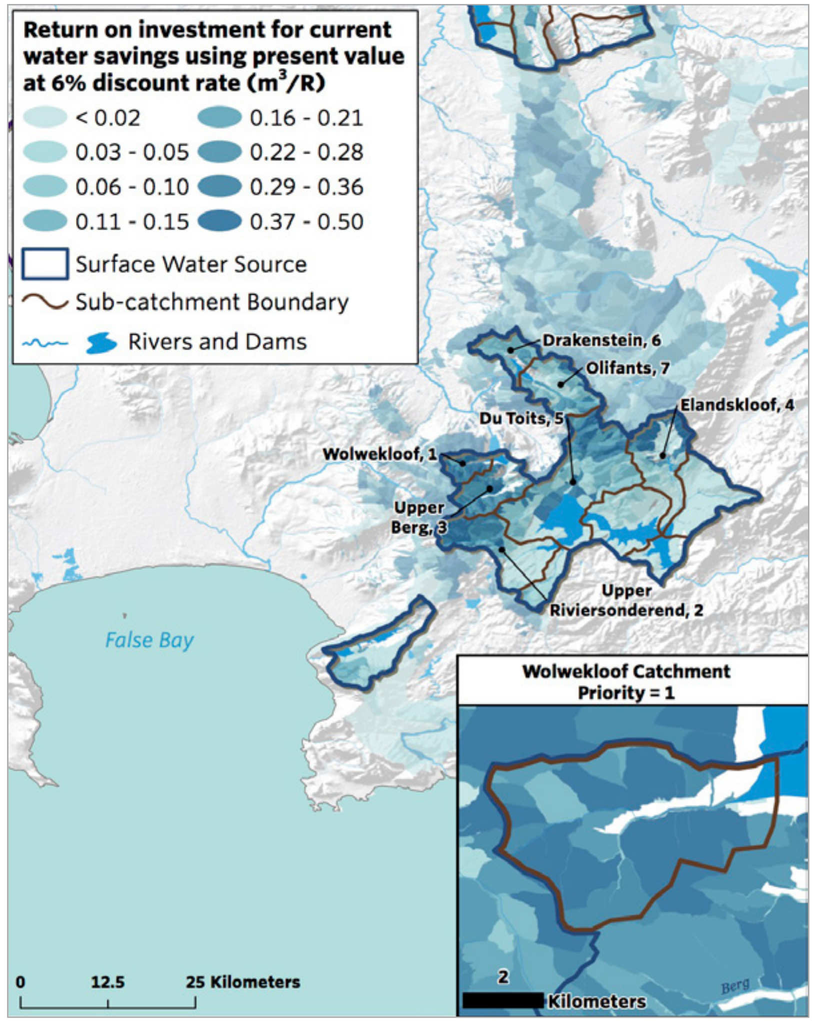


Figure 7. Priority sub-catchments identified for delivering the highest ROI.

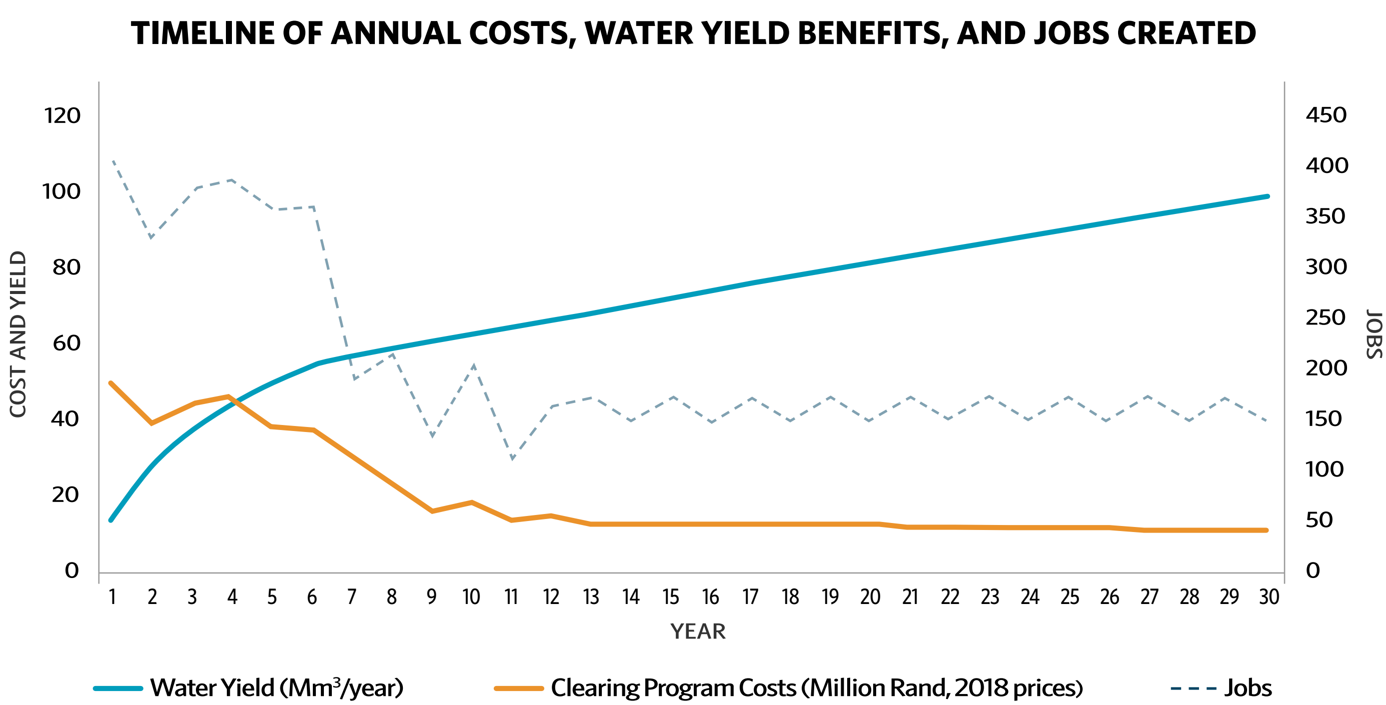


Figure 8. Restoration timeline for priority sub-catchments.

STEP 5

Building discounted restoration timeline for priority sub-catchments

Following common practice, the annual time series of costs and water yields that the invasive alien plant removal programme would produce were discounted.

Results show that investing R372 million will generate expected annual water gains of 100 billion liters (100 Mm^3) within 30 years compared to the business as usual scenario.

Importantly, invasive alien plant removal would yield up to an additional 55 billion liters (55 Mm^3) per year after initial treatment is completed in year six (Figure 8, previous page). Approximately 350 job opportunities will be created in the first six years of implementation, as removing alien plant invasions is very labour intensive.

STEP 6

Comparing cost per cubic meter (URV) and potential yield gains of restoration programme to alternative water supply options

Catchment restoration is significantly more cost-effective than other water augmentation solutions, supplying water at one-tenth the unit cost of these alternative options.

The analysis demonstrated that, including the raw water treatment cost of R0.8 per cubic meter, catchment restoration would supply water at two-thirds to less than one-tenth the cost per cubic meter as the other supply alternatives considered in Cape Town, with a URV only one-eighth that of the combined alternatives (Figure 9). The results of catchment restoration programmes will also be evident more rapidly than some of the engineering-intensive, built infrastructure options, with improved supply showing as soon as the first winter rains. Furthermore, catchment restoration produces water yield gains into perpetuity if areas cleared of invasive alien plants are maintained.

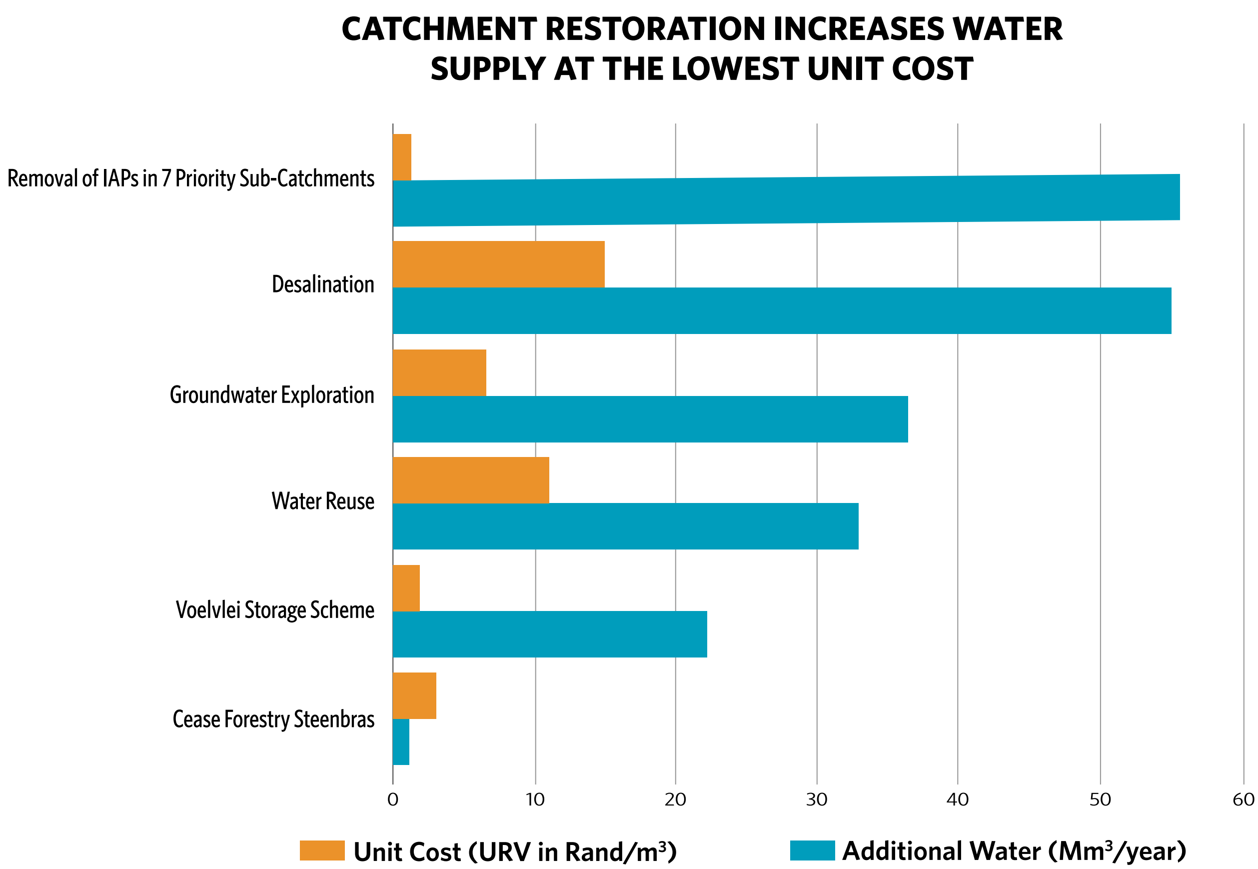


Figure 9. Water supply gain and unit cost (URV) comparison between catchment restoration and other supply options (costs include raw water treatment cost).

THE ROLE OF THE GREATER CAPE TOWN WATER FUND

Addressing the Greater Cape Town Region's water supply challenge is complex. The City of Cape Town is the biggest consumer of water and dependent on a range of sub-catchment areas that lie mostly outside of the city boundaries. The inter-connected WCWSS includes multiple users made up of different sectors and other municipalities, and involves multiple government departments at national, provincial, and municipal levels. In addition, invasive plant control programmes have been implemented for many years involving different stakeholders, both public and private, adding to the complexity of finding synergy, alignment, and collaboration.

The Greater Cape Town Water Fund is bringing together private and public sector stakeholders — alongside local communities — around the common goal of restoring the surface water catchments and aquifers that supply our water. The Water Fund aims to support and align with existing government initiatives and act as a catalyst for systemic change in catchment management by cost effective use of on-the-ground resources, strengthened capacity, and robust monitoring and evaluation. In addition, the Water Fund will stimulate funding and implementation of catchment restoration efforts and, in the process, create jobs and momentum to protect globally important biodiversity and build more resilient communities in the face of climate change.

The Greater Cape Town Water Fund builds on the experience of more than 30 other Water Funds implemented or in development across 12 countries. It is the second of its kind in Africa and the first in South Africa, pioneering the use of innovative financial and governance mechanisms to protect and restore the catchments upon which the Greater Cape Town Region's economy and livelihoods depend. The Water Fund also serves as a model for establishing water funds elsewhere in the country.

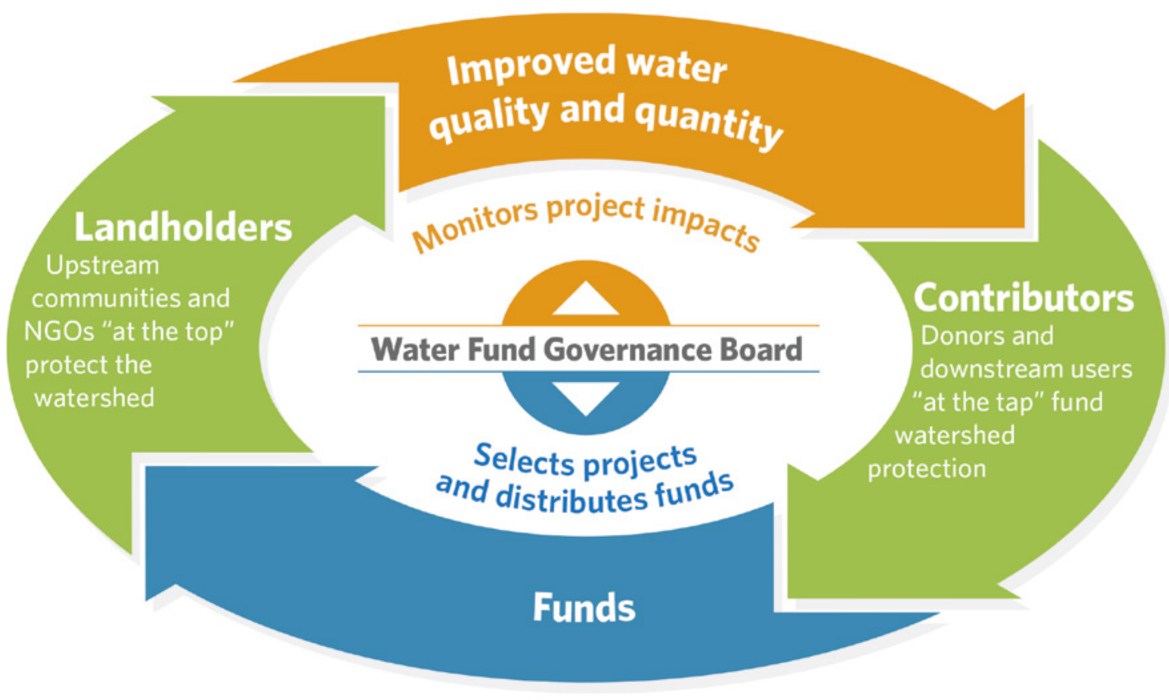


Figure 10. The major elements and flows of a Water Fund. A Water Fund is designed to cost-effectively harness nature's ability to capture, filter, store, and deliver clean and reliable water. Water Funds have four common characteristics: science-based plans, a multi-stakeholder approach, a funding mechanism, and implementation capacity.

ADDITIONAL ECOLOGICAL INFRASTRUCTURE INTERVENTIONS TO SECURE WATER

While the focus of this Business Case is on invasive plant removal to restore seven priority sub-catchments supplying the WCWSS, the scope of the Water Fund will be broader in supporting additional ecological infrastructure interventions to secure water supply. Efforts will focus on the restoration of four priority wetlands, controlling invasive alien plants in former forestry areas, and restoration of natural vegetation on the Atlantis Aquifer. Preliminary analysis in the Atlantis Aquifer has shown that 1.8 billion liters of water (1.8 Mm^3) is lost annually due to invasive alien plants.

NEXT STEPS

The Greater Cape Town Water Fund Steering Committee will use the results of this study to co-develop with stakeholders an ecological infrastructure restoration strategy for the WCWSS focused around the seven priority sub-catchments and the Atlantis Aquifer. Putting the strategic plan in place will include building the institutional capacity of the Greater Cape Town Water Fund to lead or support restoration efforts and creating mechanisms such as an endowment fund to help ensure sustained funding.

The Water Fund will support the development of differentiated employment models for the various components of ecological infrastructure restoration to maximise efficiency and effectiveness, especially the clearing of rugged terrain. In addition, the integration of fire as a control method will be implemented at scale and the results monitored. Operational flexibility will ensure timely follow up and maintenance of burned areas to avoid densification following unplanned fire events. Other priorities include the restoration and protection of wetlands upstream from the dams, riparian restoration, the development of a well-resourced and well-coordinated governance body, and continued monitoring and evaluation against targets.

CONCLUSION

The results of this business case demonstrate that restoring the ecological infrastructure of priority sub-catchments though invasive alien plant removal is a cost-effective and sustainable means of augmenting water for the Greater Cape Town Region. Spending R372 million (present value, equivalent to $25.5 million USD) on catchment restoration will generate annual water gains of 55 billion liters (55 Mm^3) a year within six years compared to business as usual — equivalent to one-sixth of the city's current supply needs — increasing to 100 billion liters (100 Mm^3) annually within 30 years. Catchment restoration is significantly more cost-effective than other water augmentation solutions, supplying water at one-tenth the unit cost of alternative options. The results presented are conservative, meaning gains could be even higher. In addition to security in water supply, catchment restoration brings wider benefits in terms of job creation, community empowerment, reduced fire risk, the restoration of native fynbos biodiversity, and climate change resilience.

Results show that investing R372 million ($25.5 million USD) will generate annual water gains of 55 billion liters (55 Mm^3) a year within six years compared to business as usual — equivalent to one-sixth of the city's current supply needs — increasing to 100 billion liters (100 Mm^3) within 30 years.

GREATER CAPE TOWN WATER FUND

The vision of the Greater Cape Town Water Fund is to ensure healthy and resilient catchments provide sustainable water yields for current and future generations.

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GENEROUS SUPPORTERS

PEPSICO · THE Coca-Cola FOUNDATION · CATERPILLAR FOUNDATION · LEVI STRAUSS & CO.

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LAND COVER SOURCE: Western Cape Nature Conservation Board (WCNCB), Scientific Services. 2014

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This business case is informed by studies by Anchor Environmental Consultants, Freshwater Research Centre, and Mark Botha.