

Urban water use

INTRODUCTION

There has been a global shift in the way that water provision for urban water use is viewed. Governments are increasingly choosing to invest in environmental health. By protecting river systems, governments can reduce management costs. In this brief, examples of international case studies related to such government interventions are presented, followed by a South African case study: the Kromme River.

BACKGROUND

INTERNATIONAL CASE STUDIES

Seattle Municipality: Purchase of the Cedar River Catchment for its water supply by Seattle, one of the unhealthiest cities in the US before the 1890s, made the city one of the healthiest in the US within 10 years.

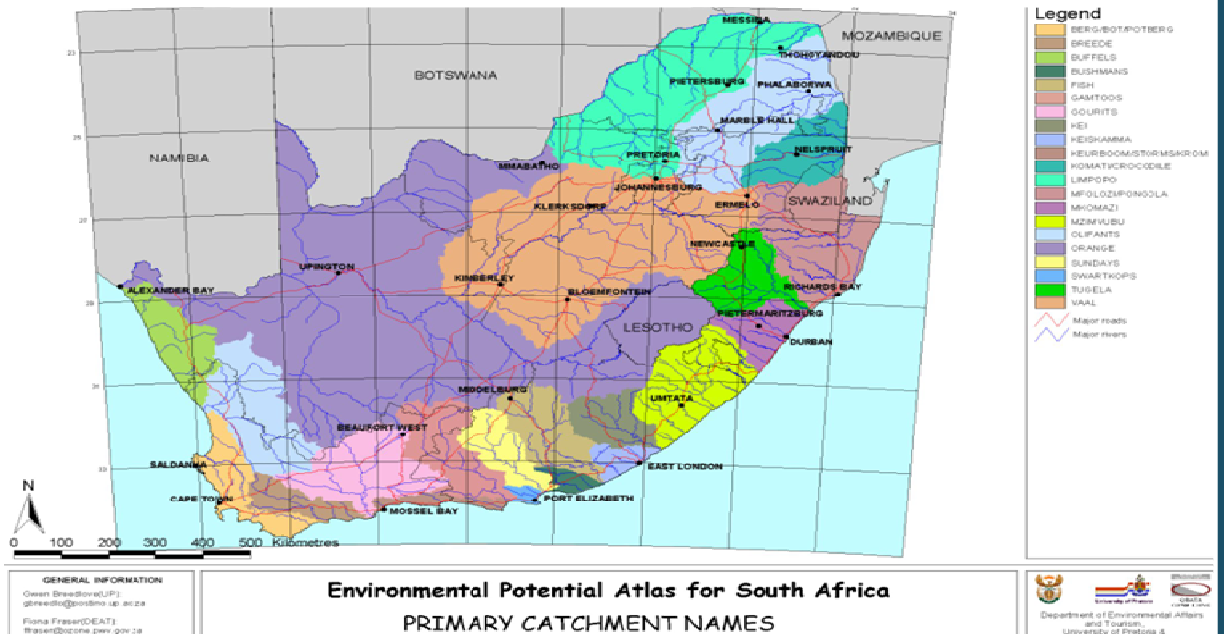
Before the purchase of the Cedar River Catchment, Seattle was an unhealthy city with epidemics of cholera and typhoid and major water shortages. Purchasing a catchment solely for water provision (i.e. all agriculture and forestry was ceased) was considered expensive and risky at the time, but the endeavour was a huge success.

Within 10 years clean water began to flow once more, and outbreaks of cholera and typhoid ceased. This endeavour not only provided the city with clean water and improved the health of its citizens, it also saved the city hundreds of millions of dollars in the long term. This is because the use of natural systems for water provision services proved substantially cheaper than creating an artificial system, such as a water filtration plant (Cosman et al, 2012).

RECOMMENDATIONS – SPECIFIC TO NELSON MANDELA BAY

- **Protect what we have:** Protecting our natural resources will ensure their services are delivered in perpetuity. The Kromme case study, which illustrates this, may be applied to other catchments in South Africa.
- **Forming partnerships:** Landowners (service providers) are based in water-providing catchments and their actions have an impact on the water produced that municipalities (end-users) benefit from. Municipalities need to form partnerships with landowners to assure the supply of high quality of water.
- **Align incentives:** All stakeholders must work towards the same goal. Landowners must be willing to restore and protect the catchment and the end-users must be willing to pay for the delivery of services (e.g. clean and reliable water flow).
- **Communication is vital:** All government departments, implementing agents, conservation initiatives, landowners, and scientists must make earnest attempts to achieve effective communication when it comes to working in important water-producing catchments.
- **Biodiversity Stewardship Programme:** Tax and financial incentives are available to landowners who sign up to the Biodiversity Stewardship Programme through which landowners in ecologically important areas are required to manage invasive alien plants. This programme is one vehicle for such partnerships between landowners and government.
- **Law enforcement:** South Africa has sound laws for the protection of natural resources but these need to be enforced to avoid the degradation of natural resources.

WHAT IS A CATCHMENT AREA?



A catchment is an area, often surrounded by mountains, whose rainfall all drains into one body of water, such as the ocean, an estuary, or a dam. A catchment consists of mountains, the lowlands/flood plains and all the rivers running through this area. South Africa is divided up broadly into 19 primary catchments, as shown in the picture, above. Each of these 19 catchments is further divided up into quaternary catchments, which is the scale at which water management, in terms of urban water use, should take place.

New York Municipality: The municipality invested US\$1.5 billion in maintaining and restoring its Catskill Catchment and saved \$6 billion in the cost of a filtration plant plus operating costs (Cosman et al, 2012). New York City is supplied with water from the Catskill Catchment via the Catskill Aqueduct.

Kampala, Uganda: The Nakivubo Swamp provides wastewater purification services and nutrient retention services, valued at US\$1-US\$1.75 million a year. Using the existing swamp is far cheaper than the expansion and maintenance of new wastewater facilities. Despite these findings, policymakers have neglected to protect the area and the wetlands' ability to remove nutrients and pollutants has been greatly reduced – costing the country millions of dollars each year. However, after 2008 a new plan was proposed to reverse this (Kozak, 2012).

A CASE STUDY OF THE KROMME RIVER

The Kromme River in the Eastern Cape provides 40% of the water (Raymer, 2010), and it provides the cheapest* and best quality water in the Western System to the Nelson Mandela Bay Municipality (NMBM). However, the catchment that supplies the Kromme with water is in an extremely bad condition at present.

*The average operational cost of water from the Churchill Water Treatment Works is R0.54/m³ compared to R0.83/m³ in Elandsjacht and R0.93/m³ at Loerie.

The upper Kromme River valley is divided up into relatively small farms, with the main activities being dairy, livestock and fruit farming. Agriculture in this arid environment has low profit margins. The land has been poorly managed, resulting in erosion of arable soil and about 85% of the once extensive wetlands have been destroyed (ASSET Research, 2012). Loss of wetlands is serious as these provide services such as the maintenance of water quality, silt retention, flood protection, low flow augmentation and a place of refuge for animals. Since the wetlands in the Kromme have been destroyed, the flood damage is reported to have become more severe.

These services, invisible to the economy when the system is healthy, require expensive engineering solutions to replace them. This is a case where the cost of uninformed decisions by a few private landowners is carried by the citizens of Port Elizabeth over a long-time horizon.

Other factors contributing to the loss of services from the Kromme are the alien black wattles, which first appeared in the catchment in the 1940s. Currently 41ha of this area are invaded, mostly in the river itself, which equates to more than 11% of the catchment (ASSET Research, 2012). These trees use more water than indigenous vegetation (Dye and Jarman, 2004) and landowners have reported that smaller rivers have ceased flowing as a result of these trees using the water. The river itself has also been

HEADCUTS – DONGAS AND GULLIES



A headcut is caused by an activity which disturbs a river's path. Examples are building a road or railway line through a wetland, river or floodplain, allowing animals to graze in these areas, or ploughing these areas up. These activities cause damage called a 'nick-point' to the path that water flows along, and as more and more water flows past the point of damage, it will start to wash the loose sand and gravel downstream. This causes the nick-point to start moving backwards and become bigger with time. This process happens much faster during big floods. Headcuts are bad because they drain the water from the surrounding land, so it can no longer be as productive for agriculture or grazing. It also destroys wetlands – which provide many services.

Source image: http://deq.mt.gov/statesuperfund/ubmc/images/virtour/full/22b_full.jpg

structurally damaged. Many parts have been canalised and poor road construction and illegal farming in the river have taken their toll. The Conservation of Agricultural Resources Act (Republic of South Africa, 1984) prohibits certain practices and yet is not being enforced in the Kromme. These activities cause headcuts, which steadily erode their way upstream impairing the land's ability to hold water and causing loss of top soil. This is detrimental to both agriculture and water users downstream.

All of this damage has a direct impact on NMBM's water supply. Resource abuse has negatively affected the quantity and quality of water the city receives, requiring costly engineering interventions and alternative water sources being developed sooner than would otherwise be necessary. The attempts by landowners in the Kromme to increase their short-term financial gain has had adverse implications in the long-term for the public water resources and has at the same time reduced the capacity of the agricultural land to support the farmers' livelihoods.

WHAT IS RESTORATION?

When humans get ill, they go to a doctor who fixes them so their bodies can function properly again. When land, rivers and mountains are damaged or "ill", they also need to be fixed so that they can function properly again. South Africa and all its people rely on the ability of the land to function properly.

They need its fresh, clean water, its healthy soil for agriculture, and especially need its ability to protect the population from extreme events, particularly in the face of climate change.

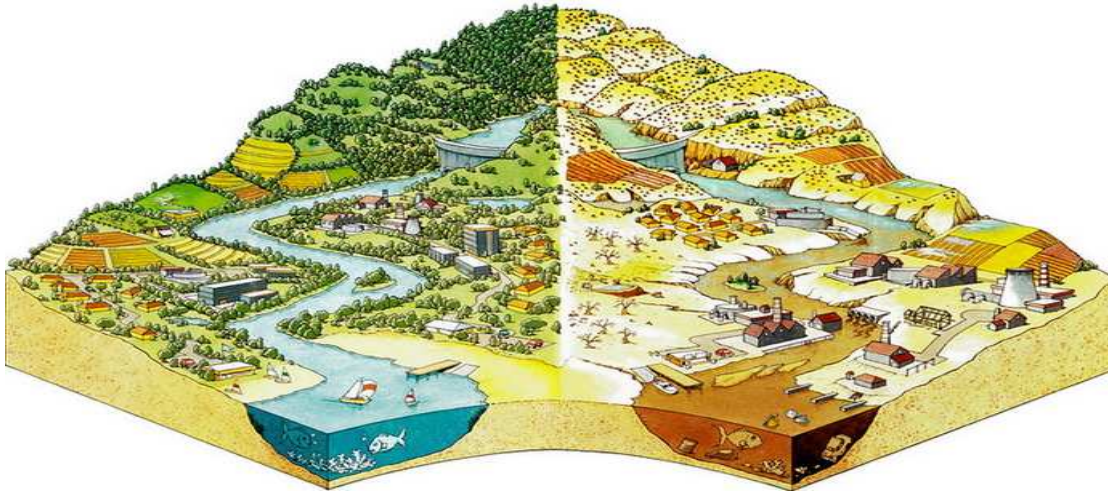
There are many ways to "fix" or "restore" the environment. Some ways include cutting down alien (from another country) trees and plants that use up all the water. Other types of restoration include fixing up damaged wetlands by building concrete structures to stop the soil being washed away. It could also be re-growing plants in areas where animals have been allowed to overgraze and all that remains is bare soil.

WHAT IS BEING DONE?

Working for Water: In the 1990s scientists recognised the widespread damage to the land and the urgent need for restoration. In 1996, the government's Working for Water (WfWater) programme began clearing the invasive alien trees in the Kromme.

WfWater aims to make more water available by clearing invasive alien plants that use high amounts of water. It is run through the Department of Water Affairs. Since WfWater started in 1995, more than one million hectares of invasive alien plants have been cleared throughout the country. WfWater has also provided jobs and training to about 20 000 people a year. These people are drawn from the most marginalised areas, and of the total, 52% are women. Currently there are 300 projects in all nine provinces.

INTEGRATED CATCHMENT MANAGEMENT



Integrated catchment management is a form of management and planning where a catchment as a whole is looked after instead of the more traditional piecemeal approach. This is based on the fact that all aspects of nature are intimately connected. It is not possible to separate land management from water management and successfully look after natural resources. *Image from: Waterwatch Queensland (http://www.georgesriver.org.au/IgnitionSuite/uploads/images/poster_healthy_catchment%20qld%20waterwatch%20sml.jpg)*

Working for Wetlands: The Working for Wetlands (WfWetlands) project was started in 2000 by the South African National Biodiversity Institute (SANBI) on behalf of the Departments of Environmental Affairs, Department of Agriculture, Forestry and Fisheries and Department of Water Affairs (DWA). It aims to fix up the wetlands of South Africa as well as draw unemployed people into the productive sector of the economy. There are 40 projects running and in 2009, 95 wetlands were rehabilitated in all nine provinces, jobs were created for 1500 people and 250 small businesses were supported. In 2000, Working for Wetlands began to physically rehabilitate the Kromme, building cement structures to stop the headcuts moving further up the river, preventing the loss of more arable land.

Biodiversity Stewardship Initiatives: The Biodiversity Stewardship Initiative (BSI) is an initiative of Environmental Affairs and Tourism (DEAT) as well as key conservation organisations such as Eastern Cape Parks. The BSI allows landowners with land that has rich biodiversity to enter into an agreement to secure legal protection for their land. The initiative offers support and advice from nature conservation agencies and funding from government to protect valuable resources. It employs landowners to look after their land in a way that will protect these resources in perpetuity. An estimated R22 million has been spent on the restoration of the wetlands (WfWetlands) and over R12 million devoted to the removal of invasive trees (WfWater). Restoration in the Kromme catchment is regarded as an investment, it will improve the ecosystem and preserve services for posterity.

Integrated Catchment Management: This integrated catchment management is currently not well integrated due to poor communication. Landowners should be included in the process and agricultural practices need to change to provide a lasting legacy. In addition, integrated catchment management needs to be made financially viable and appealing to landowners if the benefits of restoration are to be sustained. Because restoration and integrated catchment management will benefit the end-users, a suggestion is that landowners should be paid to manage their land in such a way that the ecosystem services their land provides are optimised for downstream users in the long term. Essentially they would be paid for providing good quality water, or "farming water".

ANALYSIS

A cost-benefit analysis, as performed in Kromme River Catchment to assess the economic viability of restoration activities should be undertaken in each case to determine the viability of any planned intervention. The additional yield resulting from clearing one hectare of alien invasive plants in the Kromme amounts to 3207m³ of water per year. On average, about 140ha of invasive woody trees are removed each year. Thus the NMBM can expect an additional 440 000m³ flowing into the Churchill Dam each year. The economic value or NMBM's willingness to pay for this additional water amounts to around R540 000 per annum. However, private landowners also benefit from the restoration in terms of increased land productivity and on-farm increased water availability.



The government's Water for Work programme (left) and Working for Wetlands programme (right)

CONCLUSIONS

An important finding of this study was that the benefits of the restoration are not economically viable over a 25 year period *for water production alone*. Other services that are also provided by restoration such as improvements in water quality, the security of the water source, increased agricultural productivity and increased flood protection contribute to the viability. Restoration programmes protect the catchments and provide employment and capacity building opportunities. The restoration in the Kromme area provides around 500 jobs per annum and spends R4 000 on wages for every hectare cleared.

WfWetlands provides an additional 100 jobs per annum. Government's New Growth Plan aims to create five-million new jobs by 2020 (National Planning Commission, 2011). Restoration of catchments could therefore help meet these

targets while addressing other issues such as securing long-term sustainable water supply for cities.

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ABOUT THIS POLICY BRIEF

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