BIZCOMMUNITY

# Stormwater harvesting could help South Africa manage its water shortages

By Kirsty Carden and Lloyd Fisher-Jeffes

22 Mar 2017

In 2016, South Africa experienced one of the worst droughts in decades. Many towns and cities across the country were left with compromised water supply systems and limited food production. This placed pressure on an already fragile economy.



South Africa must find ways to adapt to and mitigate water insecurity threats. These can be from droughts, climate change, but also from increases in water demand through urbanisation, population growth and rising standards of living. Towns and cities need to start operating within the limits of their existing water resources.

To avert a future water crisis, the country needs to seek alternative sources of water supply and reduce its reliance on conventional surface water schemes like dams and reservoirs.

Stormwater harvesting is the collection and storage of rainfall run-off in open ponds or aquifers. It's been identified as one alternative water resource that could supplement traditional urban water supplies. Stormwater harvesting is different to rainwater harvesting. Rainwater harvesting is the collection and storage of run-off water from an individual property with private use – usually from the roofs of buildings.

Stormwater harvesting can improve water security and increase resilience to climate change in urban areas. It can also prevent frequent flooding and provide additional benefits to society – such as creating amenities and preserving biodiversity.

There's a significant variation in rainfall across South Africa, and most parts of the country are well placed to harvest stormwater. For example, Cape Town obtains roughly 400 million cubic metres of water annually from its supply reservoirs. But more than three times this amount falls onto the city every year as rain, that becomes stormwater.

## Stormwater potential

A recent study of the Liesbeek River Catchment in Cape Town found that stormwater harvesting had the potential to reduce

the total current residential potable water demand of the catchment by more than 20% if the stored stormwater was used for purposes like irrigation and toilet flushing. For such a reduction to take place, the vast majority of residents would be required to make use of harvested stormwater. This would likely necessitate changes to the regulations related to the supply of water in the city.

There's only been one large-scale example of successful, long-term stormwater harvesting in South Africa. This is in the town of Atlantis on the country's west coast. This low rate of adoption of stormwater harvesting is likely due to a range of socio-institutional challenges. These include resistance to innovative approaches, fragmented and underfunded water management institutions, a lack of political will, and a shortage of capacity required to operate and maintain the harvesting process. There are however signs of increasing interest of utilising stormwater as a resource in the country with a number of smaller scale schemes being undertaken.

There are several international examples of large-scale stormwater harvesting. One of the most comprehensive is in Singapore where it has been shown to be a useful high-quality water resource. Other initiatives in the US and Australia highlight that harvested stormwater is used for a range of purposes including irrigation, toilet flushing, commercial and industrial uses.

## How they work

Stormwater harvesting schemes all make use of some form of storage system. Some make use of retention ponds with permanent water storage. Others make use of detention ponds; these are normally dry except following large storm events when they temporarily store stormwater to reduce downstream flooding.

Detention or retention ponds are used to store run-off volumes. This results in the reduction of downstream flows, and decreased flooding. Stormwater can infiltrate into the ground from these ponds, or it can be intentionally injected into boreholes so that it can be captured and stored in aquifers. This is a process known as managed aquifer recharge.

There are further opportunities for stormwater managers to actively manage the systems using real-time control. This can be done in a way that, prior to a predicted storm event, the storage is partially emptied resulting in an increase in the flow rates in the river ahead of the storm, but a decrease in the peak flows during the storm, which could prevent flooding. In this way, additional storage capacity is created for stormwater harvesting purposes.

## Few and far between

Stormwater and higher-quality treated municipal effluent in Atlantis are used to recharge the aquifer beneath the town for later extraction through boreholes. The scheme has successfully ensured a consistent supply of water for the town over the last 37 years. Approximately 30% of the town's groundwater supply comes from the artificial recharge scheme.

But research shows that it should also be seriously considered as an alternative water source in other areas. In Cape Town most of the harvestable stormwater is only available during the wet winter months when the reservoirs are typically filling in

any case. If it were properly captured it could be used as a way to reduce normal demand during this time.

This can be done by increasing the rate and level to which these reservoirs fill up to ensure an increase in the availability of water during the dry summer months.

## Additional benefits

Stormwater harvesting can have spin-off benefits too in terms of protecting natural assets like parks, wetlands and ponds. This in turn has benefits for biodiversity as corridors to support indigenous vegetation within an urban area are created. There's also potential for these systems to provide water treatment functions through naturally filtering and biologically treating polluted urban stormwater.

For example, the positive amenity generated by stormwater harvesting in the Liesbeek catchment was estimated at between R2 million and R7 million a year in 2013. This was calculated by the public's willingness to pay for a change in the quality or quantity of an environmental good or service like recreational use, added property value, water treatment, or flood alleviation.

Stormwater harvesting offers an alternative water supply source. It's almost entirely untapped in South Africa and could ensure improved water security for towns and cities across the country. Stormwater could be treated to potable standards like in Singapore. But it may not be economically feasible and it may be preferable to use the stored water for non-potable purposes like irrigation and toilet flushing.

Stormwater harvesting appears to be financially and technically viable in South Africa but it would depend on whether all sectors of society would be willing to use harvested stormwater, and for the required municipal policy and regulatory processes to be put in place.


### ABOUT THE AUTHOR

Kirsty Carden is research officer in the Urban Water Management research unit in the Department of Civil Engineering, and theme leader for the Future Water Institute, University of Cape Town. Lloyd Fisher-Jeffes is former postdoctoral researcher in the Department of Civil Engineering, University of Cape Town.