



THIRSTY LAND

South Africa's
water crisis and
how to overcome it

JOHN KANE-BERMAN

 **IRR**
South African Institute of Race Relations
The power of ideas



South African Institute of Race Relations

The power of ideas

2020

Published by the South African Institute of Race Relations (IRR)

2 Clamart Road, Richmond

Johannesburg, 2092 South Africa

P O Box 291722, Melville, Johannesburg, 2109 South Africa

Tel: 011 482 7221

E-mail: info@irr.org.za

www.irr.org.za

© South African Institute of Race Relations

Members of the Media are free to reprint or report information, either in whole or in part, contained in this publication on the strict understanding that the South African Institute of Race Relations is acknowledged. Otherwise no part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopy, recording, or otherwise, without the prior permission of the publisher.

While the IRR makes all reasonable efforts to publish accurate information and bona fide expression of opinion, it does not give any warranties as to the accuracy and completeness of the information provided. The use of such information by any party shall be entirely at such party's own risk and the IRR accepts no liability arising out of such use.

Compiled by John Kane-Berman
South African Institute of Race Relations

Cover design and Typesetting
by InkDesign

THIRSTY LAND

SOUTH AFRICA'S WATER CRISIS AND HOW TO OVERCOME IT

CONTENTS

INTRODUCTION	2
CHAPTER 1	
South African water: another man-made crisis	3
CHAPTER 2	
Political and Other Solutions	21
ENDNOTES	33

Introduction

As was the case with Eskom, South Africa's water supply and management were once admired around the world. The first dam was built in 1663 in the Cape. Having no water resources of its own, Johannesburg after it was founded in 1886 had to pump water from the Vaal River, an engineering feat described as a "hydraulic miracle". Desalination plants were built in the Kalahari in the 1970s. And at about the same time South African technology and engineering built in Windhoek what is still the world's largest plant turning sewage into drinking water.

Yet despite South Africa's own pioneering history in water, the country now faces a water crisis in the form of crumbling infrastructure, looming shortages, and serious contamination. South Africa is of course located in a water-scarce region. Its population is growing, increasing the pressure on limited water supplies to meet growing demand. Many of South Africa's problems with water are largely the result of governance and policy failures. South Africa's problem is not lack of technical skill, but its inability to mobilise private investment. The reasons are not financial or economic, but political.



South Africa's problem is not lack of technical skill, but its inability to mobilise private investment. The reasons are not financial or economic, but political.

The first chapter of this paper describes the current sources of water in South Africa and how that water is used and by whom. Current and future needs and plans are then discussed, along with the legal and policy framework governing the supply and use of water. A brief section on management follows, before the numerous problems surrounding the supply of water are described.

The second chapter then examines possible solutions to South Africa's water problems. These include proper governance and pricing, as well better conservation and the application of new technology, including desalination.

The paper argues that the problems of governance at both national and municipal level must be rectified; so too must the policy environment. In particular, an independent water regulator needs to be appointed. The paper further shows how specialists in the water sector are busy with plans to persuade the government to create the right environment for private investment in that sector. Unless this is done, the country will not be able to keep up with growing demand for reliable water supply of clean water.

CHAPTER 1

South African water: another man-made crisis

In 2018 the possibility that Cape Town would run out of water made news around the world. No sooner had drastic consumption cuts and the blessing of rain overcome that crisis than the army had to be sent in to deal with major leaks of sewage into the Vaal River, which supplies water to Johannesburg and other parts of South Africa's industrial heartland.¹ Nor was this the first time Johannesburg and neighbouring towns faced a water crisis. Four years earlier, in 2014, pumping and electrical failures reportedly caused panic when households not used to it ran out of water.² In the same year several (possibly as many as fifteen) babies died when they drank contaminated water in townships in North West province.³ Elsewhere in the province, in a township near Brits, four people lost their lives in 2014 during protests against interruptions to their water supply. Local councillors claimed that the interruptions were deliberate, brought about by municipal officials wanting to generate business for friends who had turned themselves into water vendors.⁴

One of the reasons why greater Johannesburg may face frequent water shortages for the next few years is that the additional water due to be piped in from the mountains of Lesotho will not arrive until 2025, thanks to delays in the second phase of the Lesotho Highlands Water Project, delays arising in part from the alleged wish of the minister concerned, Nomvule Mokonyane, to swing contracts for the R25 billion project towards some of her associates.⁵ South Africa is one of the few countries in the world where access to water is a constitutionally guaranteed right,⁶ yet when legal action was brought against her to obtain a court order to supply clean water to the town of Carolina in Mpumalanga, the same minister said the action was evidence of a "war against the state".⁷



At 237 litres per person per day, South Africa's domestic consumption of water is much higher than the international average of 173. On the other hand, average annual rainfall of 465 millimetres is half the world average.

At 237 litres per person per day, South Africa's domestic consumption of water is much higher than the international average of 173. On the other hand, average annual rainfall of 465 millimetres is half the world average.⁸ There always seems to be a drought somewhere in the country. Yet, as this paper will show, the country's major problem is less a shortage of water than the manner in which its admittedly limited supplies of water are managed, or rather mismanaged. Like our electricity crisis, our water crisis is man-made.

Current sources and use

Supply and demand

According to the *National Water and Sanitation Master Plan* published by the Department of Water and Sanitation (DWS) in October 2018, South Africa's "available yield" of water in 2015 was slightly under 14 billion cubic metres a year. Some 71.2% of this was surface water (mainly rivers and dams), 18.7% groundwater (including underground water stored in aquifers), 9.5% "re-used" water (including recycled sewage and other waste water), and 0.7% desalinated water.⁹

According to a report compiled for the Water Research Commission, a government agency, of the total water supply, 53% came from municipalities and other service providers. The balance, 47%, was abstracted by the holders of “water use licences” issued by the DWS, which supposedly governs all use through such licences, water having been nationalised in 1998.¹⁰ In 2018, according to the DWS, agriculture used 55% of water, industry 18%, mining and forestry each 5%, and municipalities (including households) 17%.¹¹

Then President Jacob Zuma said in his state-of-the-nation address in February 2017 that the national average of water losses was 37%.¹² In many municipalities, according to the DWS, the loss can be as high as 60%.¹³ Most of this loss – sometimes described as “non-revenue” – is through wastage and leaks. The balance is in the form of commercial losses, or consumption that is not paid for.¹⁴ In 2018 the annual loss of revenue to municipalities was estimated at R9.9 billion.¹⁵

According to a recent special report on water by the British magazine *The Economist*, most people consume water not by drinking or washing but through the water that has gone into clothing and food. A kilogram of cotton takes 9 359 litres of water to produce. It makes a huge difference what kind of food is produced: a kilogram of avocados needs 2 000 litres of water against 214 for tomatoes. Production of chicken takes 4 325 litres per kilogram, mutton 10 412, and beef 15 450. The magazine also points out that as countries get richer, demand for meat increases.¹⁶

According to the World Wildlife Fund (now known as the World Wide Fund for Nature) (WWF), it takes 35 litres of water to produce one apple, and 250 litres to produce one glass of milk. A 90-second shower takes 15 litres and a single lavatory flush uses nine.¹⁷



According to the World Wildlife Fund (now known as the World Wide Fund for Nature) (WWF), it takes 35 litres of water to produce one apple, and 250 litres to produce one glass of milk. A 90-second shower takes 15 litres and a single lavatory flush uses nine.

Rivers, dams, and transfers

Given South Africa’s highly seasonal rainfall, the storage of water is necessary to ensure year-round supply. Half of the country’s water resources originate from only 8% of the land. Dams play a vital role in storing water that flows into them from natural catchment areas, and very few large rivers have no dams on them.¹⁸ The first dam was built in 1663. South Africa and Zimbabwe are listed among the top 20 countries in the world for the number of dams built, South Africa having gone through an “aggressive” phase of dam building and inter-basin transfers between 1961 and 1994.¹⁹ The country now has altogether 5 125 registered dams, more than 4 030 of which are in the agricultural sector and are privately owned. Ownership of the rest is split more or less evenly between municipalities, the mining industry, and the DWS and other departments.²⁰

According to the DWS, government-owned dams account for 90% of dam water available.²¹ although the smaller dams serving farms and municipalities “play a critical role in local water security and climate resilience”.²² The WWF believes there may be between 150 000 and 400 000 unregistered farm dams throughout the country.²³ The severe drought in 2015, following three years of below-average rainfall, meant that average dam levels dropped from around 93% in March 2014 to 48% in November 2016, before recovering to about 59% in February 2018.²⁴ The country’s large dams have a storage capacity of around 31 billion cubic metres.²⁵

A report by the Institute for Security Studies published in 2018 quoted the DWS as having said that 146 of South Africa's 565 rivers had "very low" flows. This meant that they were being "overexploited".²⁶ According to the DWS, of 223 river ecosystem types in South Africa, 60% were threatened and 23% critically endangered. Of 792 wetland ecosystems, 65% were threatened and 48% critically endangered.²⁷ The Centre for Environmental Rights said that around 9% of the population depended directly on rivers and wetlands for drinking water.²⁸ The WWF observed that most South African rivers were "hard-working water suppliers" and that river water was the source for "the vast majority of people living in cities".

In order to transfer water from water-rich catchments to water-poor areas, the country has some 30 "inter-basin transfer schemes". The establishment of these schemes arose from the need to satisfy water demand for economic activities located far from water sources. One such scheme involves the diversion of water from Lesotho to the Vaal River, the major water source for the Gauteng region.²⁹

According to the DWS, the Integrated Vaal River System supplies water not only to Gauteng, but also to the petrochemical industries of Sasol and the Eskom power stations in Mpumalanga.³⁰ The greater Johannesburg "sprawling conurbation" ranging from Springs on the East Rand to Randfontein on the West Rand, says Anthony Turton, a professor at the University of Free State and a leading water specialist, is "unique in the world because it is the only large city not on a river, lake, or waterfront". Its water supply is a "hydraulic miracle". Some of the water is pumped from KwaZulu-Natal over the Drakensberg and discharged into the Vaal, where it is joined by water diverted from the mountains of Lesotho. Rand Water (previously the Rand Water Board), which extracts and treats this water, is the largest bulk water provider on Earth.³¹

In its master plan the DWS said that between 1999 and 2011 "river health deteriorated across all South Africa's nine water management areas". The extent of main rivers with a "poor ecological condition" increased by 500% over this period "with many rivers pushed beyond the point of recovery". Tributaries with a poor ecological condition increased by 229%.³²

Households

Various commentators have pointed out that the African National Congress (ANC) government, which came to power in 1994, has accorded high priority to providing water to people who previously did not have it, one of the results being failure to maintain, upgrade, and construct infrastructure to the extent required.³³

According to Statistics South Africa (Stats SA), the number of households with access to piped water either in their dwellings or outside or nearby has risen from 8.94 million in 2002 to 14.36 million in 2017. In the latter year there were altogether 16.12 million households in South Africa. Some 47% of these had piped water in their dwellings, while 28% had piped water outside in their yards, and 14% outside in a neighbour's yard or public area. The other 11% of households relied on boreholes, tankers, rainwater, streams and dams, stagnant pools, water vendors, wells, and springs. Some 65% of households had access to sanitation facilities connected to a public sewerage system or a septic tank. Some 17% used pit latrines with ventilation pipes. The other 17% relied on pit latrines without such pipes or on bucket latrines, or had no lavatory.

Converting some of these percentages into numbers shows that in 2017 some 1.84 million households did not have access to piped water, while the number of households with what Stats SA described as "substandard" lavatory facilities was 2.75 million³⁴. If people rather than households are counted, the DWS said that more than 3 million were still without access to "a basic water supply service" in 2018, while 14.1 million people "do not have access to safe sanitation".³⁵

The DWS pointed out in 2018 that South Africans lived in 28 000 communities and that access to sufficient water was a basic human right, while access to adequate sanitation services “is a critical element in the right to dignity and the right to an environment that is not harmful to health or well-being”. However, it admitted that while access to water and sanitation services had improved “significantly”, the “reliability” of such services “is currently declining”.

Citing Stats SA surveys, the DWS said satisfaction with these services had been “eroding steadily”: in 2005 some 76.4% of households regarded the services as good, but this proportion had dropped to 63% by 2016. This was “lower than it was in 1994”. Stats SA had also found that whereas 1.7 million households complained about the cost of electricity and 2 million about the lack of jobs, 2.7 million said the lack of safe and reliable water was the biggest challenge they faced within their municipality.³⁶

Sewage and other wastewater

According to the report for the Water Research Commission cited above, total sewage return flow to treatment works amounts to 1.8 billion cubic metres a year,³⁷ or 12% of all water used. A 2016 paper by Professor Turton said that only 16% of the sewage received by the country’s wastewater treatment works was treated to a standard safe enough for discharge into rivers and dams,³⁸ whence water treatment plants draw their water for drinking and other purposes. The rest was discharged untreated. Nearly a quarter of the water treatment works were unable to deliver safe drinking water.



A survey of 88 municipalities found that two thirds of wastewater treatment facilities for processing sewage did not meet minimum control standards.

Two years later, the DWS said that 56% of the more than 1 150 wastewater treatment works in South Africa were “in poor or critical condition and in need of urgent rehabilitation and skilled operators”. The same was true of 44% of the country’s water treatment works. Some 11% of all this infrastructure was “completely dysfunctional”.³⁹ A survey of 88 municipalities found that two thirds of wastewater treatment facilities for processing sewage did not meet minimum control standards.⁴⁰

Current and future needs and plans

Demand

According to Professor Turton, South Africa became water constrained in 2002, the DWS’s National Water Resource Strategy having indicated that 98% of all water had been allocated.⁴¹ A senior DWS official, Trevor Balzer, said that demand would outstrip supply by some 17% by 2030. The “water deficit” would be somewhere between 2.7 and 3.8 billion cubic metres a year. He was reported as having told members of Parliament that “water availability could deteriorate as supply contracts and demand escalates due to growth, urbanisation, inefficient use, degradation of wetlands, water losses, and the negative effects of climate change”.⁴² Other factors contributing to the projected gap between supply and demand were listed by the DWS as “low tariffs, inadequate cost recovery, and inappropriate infrastructure choices (for example, waterborne sanitation in a water-scarce country)”.⁴³

South Africa’s population is moving from country to town, putting additional pressure on urban areas whose water resources are already inadequate. The urbanised proportion of the population has grown by nearly 27% since 1990, with a drop of 29% in the rural population.⁴⁴ Many newly urbanised people live in shacks in what are officially known as “informal settlements”, of which there were 1 185 in 2018, 34% of them in Gauteng.⁴⁵

Infrastructure

Spending needed to repair ageing and/or damaged water infrastructure and provide new infrastructure is massive. In 2012 the then minister, Edna Molewa, was reported as having said that almost R668 billion would be needed over the next 10 years to finance the growing backlog, but that she had been able to budget for only about half the amount needed annually.⁴⁶ Professor Turton was reported in 2018 as stating that it would cost at least R800 billion to repair existing water infrastructure. Rolling out new infrastructure would push the number past R1 trillion.⁴⁷ The 2019 budget review published by the National Treasury provided an average of R44 billion a year over the next three years for spending on public water infrastructure by all levels of government.⁴⁸ The DWS had estimated a few months earlier that the funding required over the next decade would be R898 billion, and the money available R565 billion, leaving a “funding gap” of R333 billion, or R33.3 billion a year – although Benoît Le Roy, chief executive of Water Shortage South Africa, a think-tank and lobby group, thinks the gap might be double that “as there is no visible effort to embark on infrastructure projects”.⁴⁹

In 2012 the then minister, Edna Molewa, was reported as having said that almost R668 billion would be needed over the next 10 years to finance the growing backlog, but that she had been able to budget for only about half the amount needed annually.

The DWS also warned that if sustainable financing of renewal was not implemented, infrastructure would deteriorate further, “resulting in regular service interruptions in a downward spiral of community dissatisfaction, non-payments, protest, and vandalism”.⁵⁰

Legal and policy framework

As indicated above, access to water is a constitutional right in South Africa. The two main statutes are the Water Services Act of 1997 and the National Water Act of 1998. The former deals with supply and sanitation at municipal level, the latter with national water resources. Municipal water reticulation infrastructure includes more than 290 000 kilometres of pipelines, an estimated 7.7 million house connections, more than 5 million yard taps, and more than 2.1 million street taps.⁵¹

Water was effectively nationalised by the 1998 act, with the result that use is subject to regulation by the state. The DWS says there are around 80 000 water use authorisations in place.⁵² The act provides that when officials grant water licences, racial and gender redress are among the factors that must be taken into account.⁵³ The allocation of water-use licences has been bedevilled by ineptitude, political interference, racial considerations, and other factors, the effect of which has been to deter investment in mining and other sectors.⁵⁴

Farmers are entitled to keep using water in the quantities they used in the past, subject to a verification and validation process. All extraction for irrigation purposes has to be measured, recorded, and reported to the authorities,⁵⁵ although agricultural water consumption is largely unmetered, while farmers pay a lower tariff than other users of untreated water. Some 95% of water allocated to the agricultural sector is used by white farmers.⁵⁶

An ANC MP, Hlomane Chauke, in 2018 said dams on farms should be included in plans for expropriation of property without compensation,⁵⁷ legislation providing for which is now in the pipeline. Ms Mokonyane said that communities living near privately-owned dams did not have access to the water, so that it would be necessary to revise the licence conditions of these dams.⁵⁸ A senior official of the Department of Agriculture, Forestry, and Fisheries (DAFF) had earlier said that water allocation rights should not be racialised. The fact that most were owned by white commercial farmers should be seen in context with the contribution they made to ensure food security in the country.⁵⁹ During the recent water crisis in Cape Town, farmers said that they had released water from their dams into the city's reticulation system.⁶⁰

In 2017, according to Stats SA, 36.6% of the almost 13 million "consumer units" who received water from municipalities received it free of charge. Poorer households are entitled to receive 6 000 litres of free water every month, based on 25 litres per person per day for a household of eight.⁶¹ According to the DWS, in rural and/or smaller municipalities, an average of 77% of households are indigent. Municipalities with high proportions of indigent households depend on national grants to provide water and sanitation services.⁶²



In 2017, according to Stats SA, 36.6% of the almost 13 million "consumer units" who received water from municipalities received it free of charge. Poorer households are entitled to receive 6 000 litres of free water every month, based on 25 litres per person per day for a household of eight.

As will be set out in more detail below, the government's policies of affirmative action, cadre deployment, and racial transformation are also part of the policy framework affecting the supply of water (as well as other public amenities).

Management

Responsibility for water in South Africa is shared between national and local government. The national government's Department of Water and Sanitation (DWS) is responsible for various other entities, among them 13 regional water boards, two catchment management agencies, and a large number of water user associations.⁶³ Funds are transferred to water boards for the provision of regional bulk infrastructure, as well as to municipalities for water and sanitation reticulation.

All of these state agencies are subject to the provisions of the Employment Equity Act of 1998 and are therefore expected to have plans in place to ensure that the racial breakdown of their employees at all levels reflects the racial breakdown of the national and relevant regional economically active populations. Appointments to these agencies may also be determined by the ANC's cadre deployment policy. The result is that these agencies are packed with people who have got their jobs or promotions as a result of racial factors or party-political loyalty rather than because they possess the necessary experience and/or qualifications. As is the case with many other state agencies, skilled professionals have been eased out, or have not been appointed or promoted, because they are white or because they are not members of the ANC.⁶⁴ The pervasive corruption across the South African state has also undoubtedly affected institutions responsible for water and sanitation, not least municipalities. These factors are largely to blame for the crisis affecting water in South Africa. Further details appear below.

According to Mike Muller, a visiting adjunct professor at the University of the Witwatersrand and a one-time director general of water affairs, the DWS “is a case study of state destruction”. One aspect of this was a decade of nepotism in which qualified officials – black and white – were shunted aside as a succession of new ministers brought in their own top management. “Directors general and acting directors-general changed even faster than ministers, with ten in just more than a decade”.⁶⁵

Gugile Nkwinti, appointed in February 2018 to succeed Nomvule Mokonyane as minister of water affairs and sanitation, told a parliamentary committee in February this year that he had inherited a “mess”.⁶⁶ Ms Mokonyane was in the post from 2014. Mr Nkwinti was replaced in May 2019 by Lindiwe Sisulu, who became minister of human settlements, water, and sanitation in a renamed portfolio, with responsibility for housing added.⁶⁷

She took over a DWS which, in the view of Professor Turton, “has simply been hollowed out” so that “all that remains are people earning a salary but generally lacking deep experience even if they have some sort of tertiary qualification.” He added: “The hard-core Stalinist thinking installed by Nkwinti simply destroyed what Nomvula left in the way of creative thinking.”⁶⁸

Problems

Some examples at ground level

The crises over water in Cape Town and Johannesburg referred to above received extensive press coverage because of the economic and political importance of these cities. This importance was no guarantee that the problems would be dealt with, however. The DWS was accused of ignoring Cape Town’s problems.⁶⁹ With the backing of the provincial government, the city saved the day on its own by driving consumption down to 80 litres a day, a third of the national average.⁷⁰ Consumption has now gone up again.



The city saved the day on its own by driving consumption down to 80 litres a day, a third of the national average. Consumption has now gone up again.

A local monitoring and lobby group, Save the Vaal Environment (Save), said that the leakage of sewage into the Vaal had been building up over ten years at least.⁷¹ Numerous newspaper articles provided detailed reports of the various aspects of the problem, including breakdowns of nearly all the pump houses (some of which were submerged in faeces), vandalism, stench everywhere, and sewage leakages not only into the river – described by some living nearby as an “open sewer”⁷² – but also into numerous other places. One of the army officers working on the spot compared his experiences there with working to repair war damage in the Democratic Republic of Congo.⁷³ The Save organisation even sought interdicts against the Emfuleni municipality to stop it polluting the river, but these were ignored,⁷⁴ while an estimated 150 million litres of sewage continued to pour daily into a river system supporting the country’s industrial heartland and almost half its population.⁷⁵

Smaller cities have also experienced periodic problems. Grahamstown (now called Makhanda) was without water for at least ten days in 2013, prompting Rhodes University to consider closing because “there is no water for personal ablutions, for cleansing, for flushing toilets”.⁷⁶ In 2019 the Democratic Alliance (DA) reported that sewage had been bubbling up out of manholes and running through the streets of the town during a municipal workers’ strike. Private plumbers were unwilling to repair damaged infrastructure as they feared they would not be reimbursed by the failing local government.⁷⁷ The chairman of the Grahamstown Business Forum said that cadre deployment, incompetence, and corruption had almost destroyed what used to be a thriving successful municipality”.⁷⁸

Also in the Eastern Cape, people in at least 26 villages had no water for several months after September 2018 because of drought. In 2010, when a local river had last run dry, the municipality had brought tankers and provided tanks. Now there was nothing. People drank water from puddles in which cattle had urinated.⁷⁹ In a village in Peddie in the same province, taps had been dry for five years, partly because illegal connections had strained the water supply.⁸⁰ Bed-and-breakfast operators in the Eastern Cape were reported to be going out of business because they “can’t offer guests a morning shower”.⁸¹

Moneyweb reported that although the Cape Town crisis had been averted, bigger crises were playing out in smaller cities and districts across the country. Among the towns whose water had been cut off were Kimberley and Beaufort West.⁸² According to *The Citizen*, Kimberley in March 2019 was having its water turned off every night.⁸³

In 2012 the *Saturday Star* reported a local councillor in a settlement near Polokwane in Limpopo as having said that people spent three or four days or even weeks without water and that when it did come down to those lucky few with taps it was so dirty it could not be drunk. Many residents relied on municipal tankers to deliver water, but often these never arrived, forcing people to seek water from nearby polluted streams. One woman who pushed a wheelbarrow to fetch water said, “This is the only thing we have ever known in our lives – waking up early in the morning to fetch water.” One person was using a donkey cart to fetch water for family and immediate neighbours, a service for which he charged.⁸⁴



In another part of Limpopo, it was reported in March 2019 that villagers were paying R3 for a bucket of water. A member of a “water committee” in one village said, “We are forced to buy water from those who have boreholes at their homes and it is very expensive”.

The *Sunday Times* reported in 2013 that residents in more than 250 villages in the Sekhukhune district in Limpopo had had only an intermittent water supply since 2000.⁸⁵ In another part of Limpopo, it was reported in March 2019 that villagers were paying R3 for a bucket of water. A member of a “water committee” in one village said, “We are forced to buy water from those who have boreholes at their homes and it is very expensive”.⁸⁶ According to the WWF, the net result of local government failure “is that the poor often end up paying more for [water] services that they have a right to receive for free”.⁸⁷

The *Sunday Times* also reported in 2013 that it had established that 15 towns in four provinces were without water or received only an intermittent supply. In Wesselton township outside Ermelo in Mpumalanga residents had not had a drop of water in their taps for three months. In 2019 “an ANC source” in Mpumalanga was reported as having said that there was a serious water crisis in large parts of the province, where some problems were deliberate because officials were cashing in on water tanker contracts. In some cases, infrastructure was deliberately neglected or tampered with so that there was a need for the mobile distribution of water.⁸⁸ Also in 2019, the minister of co-operative governance and traditional affairs, Zwelini Mkhize, said he suspected that unscrupulous people in business with political links were sabotaging water pipes in the town of Vryburg in North West province so that they would then be called in by the municipality to bring tankers to provide water.⁸⁹

South Africa's largest poultry producer, Astral Foods, a listed company, reported in May 2019 that water supply interruptions had cost the company R85 million. Despite the fact that Astral is located near Standerton in Mpumalanga, on the banks of the Vaal, the municipality was unable to supply the necessary volume of water required daily, causing the company to issue a formal announcement to shareholders that up to 40% of production was under threat because of regular interruptions in the supply of water. Not even a court order succeeded in getting the municipality to supply water free of interruption. Astral said the interruptions were the result of deteriorating municipal infrastructure and that it was itself now pumping water from the Vaal, making use of a licence.⁹⁰

On the KwaZulu-Natal (KZN) south coast, vandalism and years of failed maintenance on municipal sewerage pumps had resulted in large sewage spills into the Margate and Ramsgate estuaries.⁹¹ *City Press* reported in April 2015 that the village of Canaan, also in KZN, had had communal standpipes, each servicing four households, since 2007 but that these pipes had not carried water for more than a year. An intern working for the Nongoma municipality said she had never had running water in her home in her life and that her two young children were often made sick by the water.⁹² In another part of KZN, the mayor warned residents in March 2019 not to drink tap water without first boiling it.⁹³

In April 2019 in Durban at least 50 people died in floods which opposition parties and private companies blamed on municipal officials for not having addressed drainage problems which had caused havoc after a massive storm in October 2017. In May 2019 a breakdown of pumping systems led to the discharge of 720 000 litres of raw sewage into the city's harbour every hour, necessitating a ban of nearly a month on fishing, diving, and other activities. Prior to this, municipal workers had staged a strike against the employment in the city's solid waste department of people claiming to be veterans of Umkhonto we Sizwe, military wing of the ANC. Also in May 2019, the mayor, Zandile Gumede, was arrested following an investigation into fraud and corruption in the award of tenders for solid waste services.⁹⁴

In 2014, raw sewage was reported to have been leaking into the Westdene Dam in Johannesburg after manhole covers had been stolen and the holes filled with rubble, causing sewage to overflow into a stormwater drain feeding the dam.⁹⁵ Several years later in Randfontein, west of Johannesburg, a farmer blamed the loss of 27 calves on sewage-contaminated water. Tombstones in the local cemetery were reported to be sinking into the sludge.⁹⁶ In 2019 the mayor of Hammanskraal, a township north of Pretoria in the Tshwane metropolitan area whose water has been contaminated by sewage since 2001, said the water was safe to drink but the DWS said it was not.⁹⁷

These few examples from a variety of different newspapers serve to illustrate that South Africa's water problems are not new, that they occur in many different parts of the country, from north to south, from east to west, that they take various forms, and that they afflict not only urban households in suburb, township, and shack settlement but also villagers in rural areas. Corruption and incompetence are clearly not incidental, but systemic. According to Stats SA, just over 30% of households in 2017 said that water was not safe to drink, not clear, not good in taste, or not free from bad smells. Some 14% said they had experienced water interruptions for a total of more than 15 days during the year.⁹⁸

Some years earlier, it was already clear that discontent was rising. At the beginning of 2014 the Institute for Poverty, Land, and Agrarian Studies at the University of the Western Cape said that more and more communities were protesting over water-related issues. Most were poor and angry. There was precious little water flowing from their taps, and when the water did flow it was dirty. The previous year the organisation said that residents in informal settlements around small towns and elsewhere were angered by corruption and what they saw as “comrades” being given tenders for work they could not do.⁹⁹ In some places residents have blockaded highways after being without water for a month.¹⁰⁰ In April 2019 residents in Moutse in Limpopo threatened to boycott the election due in May 2019 unless a 10-year-old leak of sewage into a nearby river was repaired.¹⁰¹

Deterioration

In its 2018 master plan the DWS stated that “raw water quality, being the chemical, physical, and biological characteristics of water bodies (rivers, dams, lakes, wetlands, estuaries, and groundwater), shows ongoing deterioration in many parameters”. This deterioration, said the DWS, “poses a threat to economic growth, social development, health and hygiene, and aquatic ecological functioning”.

Raw water quality was altered by discharges such as effluent from municipal and industrial wastewater treatment works, inadequate on-site sanitation facilities, and polluted stormwater. Raw water quality was further altered by diffuse pollution sources such as run-off from farms, mine residue deposits and mining areas, wash-off from industrial sites, wash-off from settlements and built-up areas, and erosion. Raw water quality was also dependent on the amount of water remaining in the source available to dilute the discharges. As the WWF points out, freshwater systems – lakes, ponds, rivers, streams, springs and wetlands – are generally the lowest points in the landscape, making them vulnerable to runoff. A high volume of clean water is needed to dilute the inflow of poor water.¹⁰²

The DWS identified other drivers of deterioration, and pressures upon rivers and wetland ecosystems, as a growing population, rapid urban expansion, increasing water storage and abstraction, construction and cultivation, the spread of invasive alien species, the destruction of natural vegetation along river banks, poor agricultural practices, and inadequate grazing management that caused erosion.¹⁰³

Contamination

South Africa faces a major problem of eutrophication, which results when nutrients, chiefly phosphate and nitrates, enter the water supply and feed bacteria that can kill people as well as fish and animals. One of the dangers in eutrophication is that it promotes the growth of a family of primitive organisms that are commonly described as “blue-green algae” but which are technically known as cyanobacteria, one of the most common species of which produces a potent toxin known as microcystin, which has hepatotoxic, carcinogenic, and neurotoxic properties.¹⁰⁴

The three main contributors to this poisoning of the water supply are fertiliser run-off, industrial effluent, and untreated wastewater, including sewage. According to Professor Turton, levels of microcystin in South Africa’s water supply are among the highest in the world, but the country’s water purification systems do not have the capacity to remove it.¹⁰⁵ In 2015 he said that 80% of the country’s sewerage works were dysfunctional and that they collectively discharged more than four billion litres of raw or poorly treated sewage every day into rivers and dams. Two thirds of South Africa’s largest dams were eutrophic.¹⁰⁶ Levels of microcystin in South African rivers towered above World Health Organisation (WHO) safety levels. Levels in tap water were much lower but were nevertheless ten times more dangerous than WHO safety levels.¹⁰⁷

As we have seen above, 54% of municipal wastewater treatment works were in a dismal state and 11% were dysfunctional last year. In 2017 the Department of Environmental Affairs issued a document entitled *National Climate Change Adaptation Strategy for South Africa* in which it said that increased pollution meant that 40% of freshwater systems were “now in a critical condition”.¹⁰⁸

In 2015 he said that 80% of the country’s sewerage works were dysfunctional and that they collectively discharged more than four billion litres of raw or poorly treated sewage every day into rivers and dams.

Some rivers are polluted by nearby households, which then also endanger themselves by irrigating food gardens with contaminated water.¹⁰⁹ Mr Nkwinti said in March 2019 that rivers and streams were dirty “everywhere you have informal settlements”. “We must instigate that these informal settlements along the rivers and streams must come to an end... We need a major construction programme, including doing away with these informal settlements”¹¹⁰ (which cannot be done in the foreseeable future).

Acid mine drainage

Mining consumes less than 5% of South Africa’s water, but acid mine drainage is a cause of contamination. Acid mine drainage leaking into the Boesmanspruit Dam was the problem at Carolina which led to the legal action referred to above.¹¹¹ More than 50% of Mpumalanga is under either a prospecting or a mining licence for coal, which could result in widespread contamination from acid mine drainage, and is indeed already doing so. According to a study produced for the Gauteng city region in 2015, the province contains 374 “mine residue areas” as well as 6 152 “ownerless and derelict mines”, which continue to pollute the soil, air, and water. Acid mine drainage has contributed to the contamination of several major rivers and dams.¹¹²

DWS figures supplied to Parliament in May 2019 indicated that more than 15% of 712 mines with water-use licences had failed to comply with their requirements. One result was contamination of rivers. Although several companies said they were remedying problems, the DWS had only 35 compliance and enforcement officials to cover the entire country.¹¹³ However, according to Professor Turton, acid mine drainage is responsible for only 15% of the pollution in the Vaal system.¹¹⁴ Professor Muller said in 2018 that water pollution from mining and industry was declining, but that that from sewage was increasing.¹¹⁵

Pollution arising from uranium remains a major problem. According to research cited by Professor Turton, 52 kilotonnes of gold were extracted over the course of the 125-year history of mining on the Witwatersrand, while 430 kilotonnes of low-grade uranium is still present in mine residue. He says that Johannesburg is the most uranium-contaminated city in the world, and that there are also growing risks of arsenic and mercury poisoning. However, both government and the mining industry deny that uranium remains a persistent problem.¹¹⁶

Weak authorities and systems

Numerous reports over several years by a variety of water professionals, officials, statutory bodies, and journalists have testified to the crisis afflicting South Africa’s water, which, as we have seen above, the DWS itself has acknowledged.

Although a commission of enquiry created in 1965 warned of “serious shortages” before the end of the 20th century, South Africa now has fewer stations to measure, monitor, and predict rainfall than in 1920, when record-keeping began.¹¹⁷ The DWS admitted that measuring systems had been “allowed to deteriorate” and that many rainfall measuring stations and gauging weirs were no longer “functional”.¹¹⁸ Among other major problems, as already indicated, has been failure to extend, upgrade, and maintain infrastructure, some of which is beyond its normal lifespan.

Marie Ashpole of the South African Institution of Civil Engineering said in 2014 that “the lack of infrastructure maintenance is leading to people dying”. One of her colleagues, Allyson Lawless, said, “Where there is no potable water, or where systems malfunction, people are at risk of contracting waterborne diseases such as cholera, dysentery, and typhoid”.¹¹⁹

As noted above, part of the reason for the neglect of infrastructure is that priority has been given to expanding access by households to piped water.¹²⁰ This is a national policy for whose implementation local government is largely responsible. Since, as we have seen, a third of this water is now provided free of charge – and much of it not paid for even when it is not officially free – local authorities have not been able to recover their costs from water users. Inevitably, this has resulted in excessive use and waste as well as the neglect of infrastructure.



In 2013 a report for the Water Research Commission said that about 50% of South Africa’s tap water was being stolen, wasted, or was simply leaking away every year.

In 2013 a report for the Water Research Commission said that about 50% of South Africa’s tap water was being stolen, wasted, or was simply leaking away every year. Record-keeping and water-metering was so shoddy that some municipalities did not even know how much water they were using. There was little incentive to save water when the user had no intention of paying for it.¹²¹ In 2018 the auditor general, Kimi Makwetu, said that “rent seeking and corruption” between public representatives and businesses were at the heart of the infrastructure crisis bedeviling municipalities. Another major problem was that councils used funds meant for infrastructure to pay salaries and creditors.¹²²

However, failure to maintain and upgrade infrastructure at municipal level is part of a much wider national problem, one consequence of which is that several major construction firms have gone into business rescue, partly as a result of inadequate government work, in water as well as in other fields.¹²³ A discussion of reasons for this failure at national level is beyond the scope of this paper, which will concentrate on the consequences and causes, especially at municipal level.

Rolfe Eberhard, an economist specialising in public policy, said in September 2018 that the Nelson Mandela Bay metropolitan area had a more serious crisis than Cape Town, as its dam levels were even lower. In the summer of the previous year, seven of eight metros had had to restrict water supplies because of low dam levels. Augmentation projects were several years late. Lack of timely investment was a fundamental reason for the crisis in most areas, but poor management, with ageing and deteriorating assets, was also to blame.

Water was a capital-intensive business, Dr Eberhard said. It took years to plan and build new infrastructure. A combination of low investment and poor management was fatal – water availability and reliability were reduced, and water quality was compromised. The problem of underspending was exacerbated by patronage and corruption. “Water infrastructure is thus ageing and performance has declined throughout the value chain, from dams, pipelines, pumps, treatment works, and distribution networks to water meters, sewers, and wastewater treatment.” Water emergencies were caused by poor planning, infrastructure management, and governance, and could be triggered by such shocks as drought.



“Water infrastructure is thus ageing and performance has declined throughout the value chain, from dams, pipelines, pumps, treatment works, and distribution networks to water meters, sewers, and wastewater treatment.” Water emergencies were caused by poor planning, infrastructure management, and governance, and could be triggered by such shocks as drought.

The Cape Town crisis, he continued, was a one-in-300-years event. Had the water system been managed in terms of agreed-on rules, dam levels would have been much higher, essentially negating the risk of a serious crisis. All of Gauteng was now at increased risk of severe and economically damaging water restrictions because of a delay of at least six years in the next water scheme¹²⁴ (phase 2 of the Lesotho project).

Reporting on a hearing conducted by a parliamentary portfolio committee in February 2019, the *Mail & Guardian* said that what had emerged was a “picture of dozens of projects delayed by a mix of corruption, angry residents, dubious contracts, and general ineptitude on all sides”. A senior official had told the hearing that the most critical delays were in building new dams and raising the walls on older dams.¹²⁵

Referring to water shortages in various parts of the country, Mr Le Roy said that they were “symptoms of the onset of total collapse of water infrastructure in South Africa”. He believed that the water situation was far more serious than the country’s energy woes.¹²⁶

The supply of water and electricity are closely linked. When 100 suburbs in Johannesburg and other parts of Gauteng province experienced water shortages in 2014, one of the reasons was a breakdown in the supply of electricity for pumping purposes. This in turn was the result of lack of maintenance, itself due in part to the absence of operational experience, resulting in the absence of contingency planning to handle emergencies. The culprit here was not Eskom, but the two water boards serving the region.¹²⁷ But, of course, power outages will undermine the ability of Eskom-linked pumping stations to keep water towers, reservoirs, dams and other facilities adequately supplied, and to keep sewerage plants in operation.

Once admired around the world, Eskom is now a catastrophic failure. A similar fate has fallen upon South Africa’s water management. According to Professor Muller, South Africa in the early 1980s had been lauded for having a world-class water planning system in place. However, Minister Nomvule Mokonyane had begun to undo all this.¹²⁸ South Africa now has institutional failures at the level of national (and provincial) government, regional and local water boards, and local authorities.

We have already seen that Minister Gugile Nkwinti said he had inherited “a mess”.¹²⁹ This is an understatement given the fact that his predecessor was largely responsible for delaying phase 2 of the Lesotho project, allegedly, as already noted, because of interference with contracts.¹³⁰ Among other undertakings that have gone awry is the Giyani Water Project, which dates back to 2014 and is designed to supply constant water to the villagers in the Mopani district of Limpopo. The project is not yet complete, and initial costs have risen from R500 million to R5 billion. Mr Nkwinti said that the cost of drilling boreholes for this project was between R1.2 and R1.4 million per borehole, against a normal price of R100 000 for similar boreholes.¹³¹ The finance minister, Tito Mboweni, said in October 2018 that it had been “plagued by malfeasance” and that it was a “cesspool of corruption”.¹³²

In 2018 the auditor general said that the overall performance of the country’s water boards, which provide bulk services to municipalities, had deteriorated over the preceding three years. A senior official of DWS said that many were hobbled by board level instability. Mr Nkwinti said that his department was trying to recover the massive debts – R6.8 billion in 2017 – owed to the water boards by municipalities for bulk water services¹³³. As at June 2018, municipalities’ own outstanding water debt (over 90 days) owed by householders, business, and government stood at R35.6 billion.¹³⁴

In September that same year, the then finance minister, Nhlanhla Nene, revealed that only 49% of municipal accounting officers and only 36% of municipal chief financial officers had the minimum level of competence. Some municipalities were without such officials altogether.¹³⁵ Earlier in the year Dr Mkhize told Parliament that 31% of the country’s municipalities were dysfunctional or distressed, a further 31% almost dysfunctional, and 31% reasonably functional. Only 7% were functioning well.¹³⁶ Mr Nene said that some cities were “teetering on the brink of collapse”.¹³⁷

According to a cover story on water in the *Financial Mail* in 2012, of the 821 wastewater treatment systems assessed by the DWS, 40 were found to be in excellent condition, 78 in good condition, 243 average, 143 performing poorly, and 317 in a critical condition.¹³⁸ Six years later, in 2018, the paper reported that according to the DWS’s own rating system, 30% were critical and 66% required some kind of intervention.¹³⁹

These problems have been a long time in the making. Under the previous government, racial, educational, and labour policy meant that far too few black people had the opportunity to acquire professional, technical, and other skills. This not only led to absolute shortages, but also caused the new government to implement employment equity legislation which provided for the employment and promotion of black people in preference to whites. In addition, the ANC, as already noted, adopted a policy of deploying its own members in preference to others to positions in all agencies of government. Professor Turton said that engineers sitting as directors on water boards were being replaced by the ANC’s “deployed cadres”, one result of which was that Rand Water currently had a board of directors “on which no single professional engineer serves”.¹⁴⁰

The impact of “transformation” policies

One of the important components of policy at all levels of government is the promotion of “transformation”. This has been held by the Constitutional Court to be a “constitutional imperative”. According to the ANC, it includes the policy of affirmative action referred to above, as well as the promotion of black business and other measures designed to redress the impact of apartheid and bring about “fundamental change in the structure, systems, institutions, and patterns of ownership, management, and control of the economy.”¹⁴¹

One consequence of these policies is that the DWS has sometimes left posts unfilled rather than dilute its racial transformation targets by hiring whites¹⁴². Highly qualified specialists (ranging from engineers to microbiologists and ecologists) were also placed under great pressure to leave, long before retirement age. Many resigned, while their replacements rarely had the same qualifications and experience¹⁴³. Sometimes when highly-skilled people were pressurised to leave to meet transformation targets, their skills were not transferred to those replacing them. The “purges” of professional staff took place at the same time as water was nationalised, undermining the ability of DWS to operate effectively.¹⁴⁴ The transformation imperative has also affected procurement decisions. Dr Eberhard thus said that contracts for water supply were often awarded according to black economic empowerment points rather than on the basis of technical competence.¹⁴⁵

Highly qualified specialists (ranging from engineers to microbiologists and ecologists) were also placed under great pressure to leave, long before retirement age. Many resigned, while their replacements rarely had the same qualifications and experience.

At an investment conference on water infrastructure in Sandton towards the end of 2017, Ms Mokonyane made it clear that she wanted a say in all investment matters. She did not want the same old companies to carry on getting work and she would decide which projects to build and who would build them.¹⁴⁶

Black farmers

As already noted, the DWS says 95% of water allocated to the agricultural sector is used by white farmers. Moreover, while the restitution of agricultural land to black people has been slower than intended, the reallocation of water has not always kept pace with the transfer of that land. The transfer of some irrigable land to black recipients without a water allocation had limited their ability to make productive use of the land. Some irrigable land had been transferred to land-reform beneficiaries without the water allocation historically used on that land, because the water rights had “essentially” been sold prior to transfer of the land.

The DWS said that membership of water user associations generally reflected landownership and water use, so that these associations “often focused on white commercial farmers’ interests”. It would work with DAFF “to identify available water to allocate to emerging black farmers”¹⁴⁷. Since there was little unallocated water available in most catchments, ensuring that black farmers had access to sufficient water for productive purposes “requires a proactive transfer of water from current users to black water users”.¹⁴⁸

Incompetence, corruption, and waste

Given the acres of newsprint devoted down the years to exposing waste and corruption across South Africa, given also the numerous allegations currently being made before judges in commissions of enquiry, there is little need to labour this point. Although she has denied wrongdoing, the *Mail & Guardian* reported that during the tenure of Ms Mokonyane irregular expenditure grew from a negligible R13 million in 2009 to some R4 billion by the time she left in 2017. When Mr Nkwinti took over from her as minister he was reported as having said he would give guilty officials a chance rather than “condemn them”.¹⁴⁹

Pricing

South Africa has no single price of water, nor an independent regulator of the price of water. Regional water boards supply water to municipalities at bulk prices which are subject to the approval of the minister. The elected local authorities running the municipalities then set retail prices for the various uses, including households, commerce, and industry. Tariffs vary between the different municipalities¹⁵⁰, 144 of which have been designated as water services authorities (WSAs) responsible for supplying potable water and sanitation services.

According to the DWS, “There are significant challenges in ensuring that WSAs set appropriate tariffs that cover costs, including operation and maintenance costs, and that promote water use efficiency”.¹⁵¹ According to the Water Research Commission, “There is...a lack of empirical data/knowledge on how the application of different tariff structures affects water use for different economic sectors and how much water contributes to the economy”.¹⁵²

The DWS says that water in South Africa “is severely under-priced and cost recovery is not being achieved”. In agriculture, “relatively cheap water has not incentivised the adoption of water-efficient irrigation practices”. At the same time, the DWS acknowledges that “the agricultural sector is important in terms of jobs and contribution to GDP”.¹⁵³



In 2013 the department had only 31% of its complement of civil engineers; 25% of the occupants of the posts that were filled were between the ages of 60 and 64, which meant that they would be retiring within five years.

Skills

The skills deficit affects both the national department and municipalities. The *Financial Mail* reported in 2012 that the department had multiplied its director posts, leaving it with layers of managers but nobody to do the work.¹⁵⁴ The South African Institution of Civil Engineering said in 2014 that the DWS had suffered “a catastrophic haemorrhaging of institutional memory over the past two decades”. In 2013 the department had only 31% of its complement of civil engineers; 25% of the occupants of the posts that were filled were between the ages of 60 and 64, which meant that they would be retiring within five years. The organisation said that the DWS admitted that it was battling to nurture and retain new recruits. This was not only because young engineers and technicians could command higher salaries in the private sector, but also because senior managers in the DWS were mostly political appointees who did not have the technical insights required to make the correct decisions.¹⁵⁵

The same institution said that almost a third of all municipalities had no civil engineers, technologists, or technicians on their staff. Some 35% of posts were unfilled, mainly because of budget constraints.¹⁵⁶ Another engineering association said that it had engineers with qualifications on its books who were ready to work in municipalities, “but they cannot get jobs because they are white”.¹⁵⁷ The South African Local Government Association said, “We did not understand the business at hand in terms of what it takes to run water services. Inappropriate people with inappropriate skills were appointed post-1994”¹⁵⁸. The *Financial Mail* reported that municipalities did not have the skills they needed, and showed no interest in acquiring them.¹⁵⁹

Professor Turton said in 2014 that there was not enough technical capacity left in government to write up terms of reference and technical specifications for tenders involving new technology.¹⁶⁰

In 2018 the DWS reported official figures showing it had 800 vacancies, while there was a 13.7% vacancy rate in the water and sanitation departments across all municipalities. The number of municipalities without any civil engineers had increased from 126 in 2005 to 202 in 2015. Smaller rural municipalities in particular were “struggling” to attract and retain engineers. The “ongoing” retirement of a large cohort of older workers was leaving significant gaps, while “mentoring” of new entrants into the water sector had become a major challenge due to the shortage of experienced personnel. The “serious shortage” of technical skills meant that the DWS continued to “over-rely on consultants”.

The establishment of local water user associations had been slow partly because of “difficulties in meeting representivity targets”.¹⁶¹

Policy problems

The investment conference in Sandton in November 2017 was called by the DWS in order to promote public-private partnerships in the water sector. However, Professor Turton said that without clear policy, no capital would flow into the water sector. He also said that the ANC’s proposals to expropriate property without compensation had helped to chase away significant foreign direct investment into the country that could have gone into private participation in water infrastructure.¹⁶² Raymond Parsons, an economics professor at North West University, was quoted as having said there was no definite long-term infrastructure plan, little reliable information on the infrastructure project pipeline, weak and unpredictable deal flow, political risks, long lead times, high transaction costs, low technical capacity to drive transactions, and sagging confidence arising from the rise in policy uncertainty.¹⁶³



Professor Turton said that without clear policy, no capital would flow into the water sector. He also said that the ANC’s proposals to expropriate property without compensation had helped to chase away significant foreign direct investment into the country that could have gone into private participation in water infrastructure.

Another problem identified by Neels Blom, a journalist specialising in water, was that most water was allocated to agriculture and households, the users least likely to pay the full costs of their supply. In This would not entice the private sector to participate in public-private partnerships.¹⁶⁴

Yet another problem, in the view of Professor Turton, is that the “politics in the ANC” prevents the use of Israeli technology, even though the Israelis are “world leaders”. However, he said, Israeli technology was being “rolled out through private sector projects”.¹⁶⁵

Risks

At the time of writing this report (July 2019), the crisis in Cape Town was over. But this was not true of the major sewerage problem in the Vaal, where the army was still working to remove sludge, rehabilitate the wastewater system, and train youths and community members to do plumbing and other jobs as well as to guard 44 pump stations from vandalism and theft. Funds were running out, and the Save lobby group was going back to court in yet another attempt to stop the Emfuleni local authority from continuing to pollute the Vaal.¹⁶⁶ Professor Turton said the Emfuleni “sewage crisis is an existential threat to our national security”.¹⁶⁷ The army (which was due to be withdrawn at the end of January 2020) was called in at the behest of the finance minister because of the economic importance of the whole region, but it is obvious from all the problems identified earlier in this paper that further crises cannot be ruled out anywhere in the country.

Neither the major cities, nor smaller towns, nor yet tiny rural villages are free of risk of either water shortages or contaminated water or both. In many places these risks apply irrespective of whether or not there is drought. Moreover, as the DWS itself admitted in 2018, “deteriorating water quality is putting human and animal health at risk, impacting negatively on aquatic ecosystems, and imposing significant costs on the economy”.¹⁶⁸



The DWS itself admitted in 2018, “deteriorating water quality is putting human and animal health at risk, impacting negatively on aquatic ecosystems, and imposing significant costs on the economy”.

Problems summarised

The problems described above fall into three broad categories: governance, policy, and technology. Poor management, wasting of water and of money, lack of accountability, lackadaisical attitudes, corruption, neglected infrastructure, and failure to collect debt are all problems of governance. Most of these arise from policy, including racial policy, the provision of free water, and the priority given to extending supply to households while neglecting infrastructure. Corruption may be said to have flourished as a result of the ANC’s policy of failing to punish it.

The recent move by the ANC to amend the Constitution to provide for expropriation without compensation is also a policy issue, with consequences not yet fully apparent. Yet another policy issue is the ANC’s overriding belief in extending the power of the state and its reluctance to privatise state-owned assets.

Few of these problems are peculiar to water, although poisoning of the water supply is the most serious form of pollution that South Africa faces. The problem of failure to maintain and extend infrastructure applies to electricity, roads, railways, and other state assets, as well as to water. In looking at possible solutions to South Africa’s water crisis, the second chapter of this paper will discuss technical and practical issues related to water as well as wider issues of governance and policy. The case for fixing all the problems of governance in water and elsewhere is so obvious and so powerful, and has been made so often by this writer and by others at the Institute of Race Relations (IRR), as to need no repetition. The same applies to the case against deterring investment, whether in water or anywhere else, by empowering the state to expropriate without compensation¹⁶⁹.

This chapter will identify possible solutions to the multi-dimensional South African water crisis. It will look at proposals contained in official documents, ideas put forward by various water specialists, and other views.

Governance

As we saw in the first chapter of this paper, governance is a major problem. Apart from what one water specialist describes as “absolutely blatant corruption” in the DWS, senior officials have very few skills,” are confused, and “do not know even what they do not know”. The first two ministers, Kader Asmal and Ronnie Kasrils, were “okay”, but since then water has been the responsibility of a junior ministry with low priority. The specialist said, “Water is the next Eskom, but it gets no headlines. What South Africa needs is a dedicated unit for water resource planning?” He also said that there was absolutely no technical or economic reason for poor communities not to have reliable water.¹⁷⁰

Overcoming South Africa’s water crisis obviously involves, at the very least, the eradication of corruption, giving water high political priority, and the appointment of qualified professionals to all relevant institutions, including not only municipalities but also water boards and other state-owned enterprises involved in the supply of water.



As long as municipalities remain in control, there is always a risk that they will use water revenues for purposes other than recovery of water costs and financing the maintenance and upgrading of water infrastructure.

Further, depoliticisation is essential. One important reform would be to remove control of water from local authorities and transfer it to an independent regulatory body. As long as municipalities remain in control, there is always a risk that they will use water revenues for purposes other than recovery of water costs and financing the maintenance and upgrading of water infrastructure.

The DWS in fact acknowledges that “potential conflicts of interest arise” from its own role as policymaker, regulator, implementer, and operator of infrastructure. Water resources regulation, which is local in nature, could be better performed by more decentralised institutions. Accordingly, consideration is being given to establishing a national authority to finance and manage national infrastructure, along with local water management institutions. The DWS said in 2018 that a “national water resources and services regulator” would be appointed by 2019.¹⁷¹ If all of these plans and proposals were to be implemented, they would be major steps in the right direction. The independent regulator, said Mr Le Roy, should report to Parliament.¹⁷²

The South African government, of course, needs no encouragement to introduce controls whether of water or anything else. Water already belongs to the state, having been nationalised in 1998. But greater regulation of extraction would need to be free of corruption and efficiently administered, while also accompanied by public education (see below). The DWS, for its part, has undertaken to “identify and prosecute major non-compliant abstractors (water thieves) across the country” by 2020.¹⁷³

Planning

South Africa under the ANC has never been short of extensive and detailed plans. Reference has already been made in this paper to the DWS's master plan published in October 2018. This document runs to more than 400 pages spread across several volumes. It contains long lists of action plans with "completion dates" attached. At least one water specialist interviewed for the present paper expressed doubts about the ability of the DWS to implement its plans.¹⁷⁴ The figures about water supply and demand given in the plan sometimes contradict one another.

Pricing

As already noted, the DWS says that water in South Africa is "severely under-priced". To achieve water security, an estimated capital funding gap of around R33 billion a year for the next ten years has to be closed through a combination of improved revenue generation and a significant reduction of costs. "The new reality" is that water will become more expensive. "Everyone – except the indigent – MUST pay for water and sanitation services".¹⁷⁵ There would be restricted supply to domestic users, and a strict "No payment = no water" approach to agriculture/industrial/commercial users.¹⁷⁶ According to the DWS, if all the people who should pay for water did so, revenue would increase by R26 billion a year, which would significantly reduce the funding gap, if such revenues were applied to the water and sanitation sector.¹⁷⁷



To achieve water security, an estimated capital funding gap of around R33 billion a year for the next ten years has to be closed through a combination of improved revenue generation and a significant reduction of costs.

The DWS also says that the costs of pollution "should be borne by the polluter and not externalised to downstream water users or the state".¹⁷⁸ This is a valid point, but it ignores the fact that the state itself owns virtually all the wastewater treatment works that are responsible for much of the pollution.

The DWS plans to "ensure that sufficient revenue is received through tariffs and grants to operate, maintain, and improve the water supply and sanitation system". The "completion date" for this undertaking is 2024. The tariff structure "must allow for cross subsidisation for the indigent and the building of a reserve for periods of drought".¹⁷⁹

Although the DWS accepts that water is under-priced, introducing a full-cost recovery system would be politically difficult, even if the poor were to be subsidised instead of being given free water. This is because the Constitution has helped to engender a culture of entitlement in which water is regarded as a right to be provided by the state instead of a commodity to be purchased. South Africa's pervasive boycott culture would also be difficult to break,¹⁸⁰ especially in light of the fact that the people who do not pay for water constitute 43% of the population who should pay. Mr Le Roy, moreover, takes the view that the South African economy cannot afford to pay more for water and has to focus instead on efficiencies, diversified sources, and "world-class management".¹⁸¹

Research and development

According to one of South Africa's leading water specialists, planning is under serious stress as information is outdated and "we do not know what we want where".¹⁸² The DWS said in 2018 that a "roadmap implementation unit" had been put in place to support intelligence gathering and coordination of the role of various authorities in research, development, and innovation (RDI). The overall investment required for the RDI master plan over a ten-year period was put at R8.4 billion.¹⁸³ However, as noted above, there are serious doubts about the capacity of the DWS to implement its own master plan.¹⁸⁴ South Africa in general also underspends on research and development (R&D). The government said in 2017 that it planned to increase the country's R&D spending from 0.77% of GDP to 1.5% by 2020.¹⁸⁵ By contrast, expenditure in 2013 in Israel, another water-stressed country Israel was 4.2% of GDP.¹⁸⁶

South Africa in general also underspends on research and development (R&D). The government said in 2017 that it planned to increase the country's R&D spending from 0.77% of GDP to 1.5% by 2020.

Another problem is the damage done to the Council for Scientific and Industrial Research (CSIR), one of South Africa's leading research institutions. According to Professor Turton, who once held a senior position at the CSIR before his position there was made impossible, management of the organisation increasingly became the function of "cadres parachuted in under the justification of 'transformation' but in almost all cases lacking the necessary scientific credentials to perform a dignified job". Not only was "enormous pressure" placed upon white researchers to leave, but entry requirements for this elitist organisation were "lowered considerably, to the point where anyone of colour with a junior degree from a historically disadvantaged university was welcomed, merely to meet quota targets". Some of these new candidates were left to flounder, which was unfair to them.¹⁸⁷

Skills

South Africa's main water infrastructure was built by skills of all kinds (even though educational and employment opportunities above menial level were denied to blacks). In the midst of the Cape Town water crisis, Neresh Pather, president of Consulting Engineers South Africa, which represents more than 560 consulting engineering companies, said that South Africa possessed the knowledge and the skills to reverse the crisis.¹⁸⁸ This was no doubt true, but South Africa's water crisis goes far beyond the one experienced in Cape Town.

One immediate (and obvious) part of the solution is to make use of all available professional and other skills. South Africa's skill shortage is exacerbated by reluctance on racial grounds to make use of them all. Essential then to overcoming the crisis is to remove racial barriers from employment policy, abandon cadre deployment, and liberalise restrictive immigration law. Unlike the time-consuming process of bringing about necessary improvements at all levels in South Africa's education and training system, these remedies are available immediately.

The DWS, for its part, plans to “develop and implement a programme for recruiting experienced technical and managerial staff first in South Africa and then internationally”. This has a completion date of 2030. Defining career paths and on-the-job experience to build a knowledgeable sector of professionals has a completion date of 2023.¹⁸⁹

Conservation

Conservation involves reducing waste, cutting consumption, and replacing fresh water with “non-conventional” or “manufactured” water where possible. Price, attitude, and technology all come into play. The pricing of water at its actual cost is one means of reducing waste and consumption.

Leaks

In its master plan, the DWS sets a target of reducing water losses and non-revenue water to 15% below “business as usual” by 2030.¹⁹⁰ There are various ways in which losses via leaks can be reduced. One, of course, is price. Another is lowering pressure. According to Mr Le Roy, pressure-reducing valves can be installed so that unnecessarily high pressure during periods of low demand (such as at night) can be reduced. Such valves have been installed in Cape Town.¹⁹¹

The WWF has been working with a Danish company, Kamstrup, on a pilot project in the Lerupurupung village in Limpopo to install water meters to monitor water use and track irregularities. This is a remote area whose community members often do not know to whom to report leaks and broken taps, with the result that it can take days – even weeks – to locate and fix leaks. Denmark suffers only 5% leakages. DWS is said to be training 15 000 new plumbers to minimise losses through leakage.¹⁹² Professor Muller wrote in July 2019 that more than 3 000 school leavers promised jobs as “barefoot plumbers” to fix the country’s copious leaks were “now demanding to know when and where they can sign on”.¹⁹³

Consumption

In addition to reducing waste, water can be conserved by cuts in consumption.

Public education played an important part in significant reductions in consumption in Cape Town, which was drastically reduced as the threat of “Day Zero” loomed. Professor Muller said in 2018 that municipalities in Gauteng and elsewhere would have to reduce per capita consumption by 30% over the next decade to avoid the risk of serious restrictions in the event of drought.¹⁹⁴ But other parts of the country will also have to reduce consumption. In its master plan published in October 2018 the DWS set a target of reducing average consumption from its current level of 237 litres per person per day to 175 litres per person per day by 2025. Everyone, it said, MUST use less water for the same activities.¹⁹⁵



In its master plan published in October 2018 the DWS set a target of reducing average consumption from its current level of 237 litres per person per day to 175 litres per person per day by 2025. Everyone, it said, MUST use less water for the same activities.

The DWS said that if it could cut domestic consumption from 237 to 175 litres a day, and also reduce urban losses from 35% to 15%, then South Africa's total water requirements in 2030 would be only 88% of what they might have been without these "demand management interventions". We would thus be consuming 15.46 million cubic metres in that year instead of 17.56 million, a saving of 2.1 million cubic metres.¹⁹⁶

Irrigation

Agriculture accounts for 2.4% of GDP and for about 55% of water usage. Most farms around the world rely on rainfall, fewer than 20% making use of irrigation. Nearly all of these use flood irrigation, while only about 5% of irrigated agricultural fields around the world use drip irrigation or other micro-irrigation techniques.



Agriculture accounts for 2.4% of GDP and for about 55% of water usage. Most farms around the world rely on rainfall, fewer than 20% making use of irrigation.

Flood irrigation is wasteful in that it uses more water than necessary, some of it nourishing weeds and some being lost to evaporation. Overhead irrigation from centre pivots can also be wasteful in that water is dispersed by the wind or dropped on leaves rather than to the roots of the plant. Drip irrigation, on the other hand, enables the proper volume of water with the right concentration of fertilisers to be delivered to the roots of crops and significantly reduces evaporation losses.

According to Netafim, an Israeli company that pioneered drip irrigation but is now largely Mexican owned, drip irrigation is widely used in South Africa, including in the citrus and wine industries. Some South African water specialists believe that South African producers in some of these fields could "teach the Israelis a thing or two".¹⁹⁷ Drip irrigation is also used in the cultivation of products that include avocados, mangoes, macadamias, bananas, litchis, and various kinds of berry. New markets are being explored for vegetables. Netafim says that drip irrigation via the overhead centre pivot system is suitable for soya beans, wheat, potatoes, onions, and lucerne.

As far as South Africa's major crop, maize, is concerned, drip irrigation is in its infancy. "It is a very new concept and a lot of data still has to be collected," says Netafim, "but we are starting to use drip irrigation and pivots together and getting very good results. Drip lines dragged on the ground by the centre pivot make possible the slow methodical release of water and nutrients directly to the soil area". Up to 20% yield increases have been recorded over a conventional centre pivot system.¹⁹⁸

A leading South African maize farmer points out that most maize farming in this country is dry-land farming. However, where farmers do make use of pivots, attaching dripper lines to them could increase the maize yield from 12 tonnes per hectare under conventional pivots by three or four tonnes. An estimated saving of 60% of the water used per hectare will enable more hectares to be planted with the same quantity of water. This farmer is convinced that drip irrigation will be introduced more and more into the maize sector because of the "prohibitive" costs of the electricity needed to pump water.¹⁹⁹

Farmers in South Africa pay for water. This applies even to water drawn from dams built at the expense of the farmers themselves. Varieties of seed that use less water, as well as less fertiliser, pesticide, and herbicide, are more expensive than conventional seeds. These higher costs, virtually all of them dollar-based, are a major disincentive for farmers. On the other hand, rising electricity prices are likely to be a major factor encouraging more efficient use of water.

Replacement

The third major means of conserving freshwater is to replace it with “manufactured” water in the form of recycled wastewater or desalinated water. In South Africa nearly all agricultural water is natural, drawn from rivers, dams, and boreholes. Manufactured water is in turn one means of augmenting a country’s water supply.

Augmentation

There are various ways of augmenting South Africa’s water supply. Cape Town, for example, currently receives 95% of its water from six large rain-fed dams and a number of smaller dams, but is evidently planning to reduce this reliance to 75% by 2029, relying on groundwater extraction, desalination, and treated wastewater for the other 25%.²⁰⁰ One water specialist said that Cape Town could possibly get 50% of its water needs through the recycling of wastewater.²⁰¹

As noted below, 62% of Israel’s water is recycled or manufactured. By contrast, very little water in South Africa is recycled and reused, while even less is produced through desalination.²⁰²

Surface water

Professor Muller says that dams are the cheapest option but they are very “contextual”.²⁰³ Moreover, according to South Africa’s National Water Resource Strategy published by the DWS in 2013, most of the economically available yield from surface water has already been fully developed and utilised. Although a number of dams are being extended and/or built, DWS says there is limited opportunity for more dams. South Africa is approaching full utilisation of available surface water yields and is running out of suitable sites for developing large dams, which can take 10 to 15 years to build. Where additional water is available it is located in areas relatively remote from the existing centres of demand. The DWS nevertheless envisages that the amount of surface water available will increase by some 874 billion cubic metres by 2030.²⁰⁴

Various water transfer projects are under way, notably an additional dam and transfer tunnel as part of the second phase of the Lesotho project, and the Western Aqueduct in KZN delivering water from inland dams to eThekweni (Durban). But there is limited opportunity for more transfer schemes, partly because of the very high cost²⁰⁵ of conveying water over long distances with tunnels and/or pumping.²⁰⁶ One water specialist points out that the conveyance of water is far more expensive than the conveyance of electricity.²⁰⁷

Groundwater

The DWS says groundwater is a significant source and is often the only water resource in many parts of the country, although local yields are usually quite low. This resource was nevertheless “undervalued and underutilised”. Total nationally accessible groundwater potential was approximately 4 500 million cubic metres a year, of which between 2 000 and 3 000 million cubic metres were being utilised. This meant that an additional quantity of between 1 500 and 2 000 billion cubic metres was available. However, the master plan envisages an increase of only 405 billion cubic metres by 2030.

This additional potential supply was also widely distributed across the country, offering particular opportunity for small towns, villages, mines, and individuals for domestic use, irrigation, and stock watering.²⁰⁸ The storing of surplus surface water underground in an aquifer for later abstraction and use was growing in importance in South Africa and internationally. Underground storage meant that water reserves were not vulnerable to losses from evaporation.²⁰⁹

It was reported in April 2019 that there had been a major increase in the number of boreholes in Cape Town. An environmental group said that drilling was being carried out in environmentally sensitive areas without anyone knowing the potential long-term impact, although provincial government officials said groundwater levels in the Cape Flats aquifer had not been adversely affected.²¹⁰ The WWF has warned, however, that if too much groundwater is abstracted close to the coast, seawater can flow into the depleted aquifer affecting water quality.²¹¹



It was reported in April 2019 that there had been a major increase in the number of boreholes in Cape Town.

Desalination

According to Mr le Roy, desalination is not new to South Africa, having been implemented in the Kalahari and Namibia in the 1970s by Membratex, a joint venture between De Beers and the government (and now owned by the French water conglomerate Veolia).²¹² The DWS said that desalination of brackish groundwater had been in operation for “decades” in various small towns and settlements in the Northern Cape, sometimes for emergency supply during droughts. The coastal town of Bushman’s River Mouth in the Eastern Cape had been served by a seawater desalination plant for more than 20 years. During the drought of 2009–2011 in the southern Cape, several small desalination plants were established at towns that included Sedgefield, Knysna, Plettenberg Bay, and Mossel Bay. The last of these had been mothballed since its completion as an emergency scheme in 2011, as its water had not been required since then.²¹³ Israeli officials said that there was also a desalination project in Richards Bay, which was using Israeli technology.²¹⁴

The DWS reported in 2013 that small-scale seawater desalination was being used in certain areas, that mine water desalination was becoming more important, and that the desalination of seawater on a large scale was “imminent” except that it would be very expensive to support inland areas with desalinated seawater. The DWS said that desalination could be an “unlimited resource of fresh water”, although the “escalating cost of energy” was a “concern”.²¹⁵ This was in 2013, since when the price of electricity has risen even more. Another problem with desalination is how to dispose of highly concentrated brine.²¹⁶

Nevertheless, the DWS said in 2018 that with the cost of desalination decreasing due to advances in technology, desalinated water (sea, brackish groundwater, and wastewater) was “increasingly economically viable”.²¹⁷ The DWS also said that treated acid mine drainage and desalinated seawater “will make a significant contribution to South Africa’s water mix” by 2040. It envisages an increase of 110 billion cubic metres a year by 2030 and 210 billion by 2040.²¹⁸

According to the WWF, desalination is quite widely used by mines to clean up polluted mine water and acid mine drainage. Professor Turton said that the key expertise in mine water desalination was vested in Prentec, a medium-sized but world-class company, which was aiming for 90% water recovery in its Tweefontein Plant near Ogies on the Mpumalanga coalfields.²¹⁹

During the crisis in Cape Town in 2018, Murray and Roberts, a major construction company, said that numerous companies were capable of providing desalination plants.²²⁰ Three were built by private contractors, from whom the city was buying water in 2019, although there were various problems with them.²²¹ Professor Muller said that although desalination was a useful source of water, reusing waste water was much more cost-effective.²²² Desalination was the most expensive water and should be used only when other options had been exhausted.²²³

According to Mr Le Roy the costs of extracting surface water are rising while those of desalination are coming down, provided that renewable energy rather than expensive Eskom power is used. Moreover, scale was very important. Cape Town was considering expanding desalination and Durban and Port Elizabeth were busy with feasibility studies. However, he pointed out, desalination can be used only around the coast. It cannot be used to manufacture water for inland use because of the high cost of conveying it – although coastal use of desalinated water would of course reduce coastal demand for natural water, which would then become available for use elsewhere.

Nevertheless, Mr Le Roy cautioned against rushing in – as did Professor Muller. An analysis over 40 years needed to be done and scale was needed.²²⁴ The WWF noted that desalination was globally two to four times as expensive as other sources of water, and that some wealthier countries had had to mothball desalination plants because of excessive energy costs. In the last ten years, according to the Minerals Council South Africa, the price of electricity to industrial users has risen by 523%.²²⁵

Professor Turton nevertheless warned against being “blinded” by the cost of desalination. “We have no real benchmark for desalination costs in South Africa because all projects to date have been on small plants with a limited yield.” These produced water at a very high cost. “Large-scale desalination, such as that done in Israel, Spain, the Middle East, and Australia, is driving the cost down to affordable levels.”

As for expertise, he said that a Cape Town desalination company had provided Singapore with solutions, “although it was unable to win one contract in its own country”. Three South African companies, Group Five, Murray and Roberts, and Aveng had built a desalination plant north of Swakopmund in Namibia to supply treated seawater via overland pipeline to the Trekkopje uranium mine, some 50 kilometres inland.²²⁶

Recycling

The recycling of sewage is nothing new to South Africa. According to Mr Le Roy, the country has been doing this for 100 years. As we saw in the first chapter of this paper, there were no nearby rivers to supply the needs of the mining industry and the growing urban population after the discovery of gold on the Reef in 1886, so that sewage and other wastewater discharged into the Vaal River in the south and the Crocodile River in the north had to be pumped, treated, and conveyed back to the Reef after having been diluted in the rivers. The mines built cities and had to supply them with water, which was done by private companies before the establishment of the Rand Water Board in 1903 with the duty of supplying water to mines and settlements stretching from Randfontein to Springs.²²⁷ Rand Water, said another specialist, had to fetch water from a long way away and was a world-class institution and one of the largest such institutions for a long period of time. But in the meantime, said Mr Le Roy, a South African company, Bateman Water, built a dozen large sewerage plants in Israel in the 1990s.²²⁸

Professor Turton pointed out that South Africa in the 1970s became a global leader in the management of water after a commission of enquiry had predicted that economic development was at risk of being constrained by water shortages. Among other achievements, the CSIR had developed sewage recycling technology that was put into operation in Windhoek. This was a “world first.”²²⁹ According to Mr Le Roy, the Goreangab Water Reclamation Plant there, operational since 1970, is still the biggest such plant in the world. Moreover, unlike most sewerage treatment plants, which take water from rivers into which sewage and other wastewater has been discharged, the one in Windhoek takes water directly from sewage and treats it to make it safe enough to drink. The plant supplies about a quarter of Windhoek's water, all of it potable.

Beaufort West in the Western Cape also has a sewage treatment plant that reclaims sewage directly for potable water supply to the town. Atlantis, just north of Cape Town, discharges treated sewage into the aquifer, which then becomes groundwater in the form of aquifer recharge.²³⁰ Polokwane in Limpopo also has a plant which uses treated wastewater to recharge groundwater.²³¹

According to the DWS the indirect reuse of wastewater accounts for some 14% of all available water. In its 2013 National Water Resource Strategy report, the DWS said there “is huge potential” for increasing reuse of waste water, at the coast as well as inland. In 2018 it said there was “huge scope” for developing this resource, especially in larger towns and cities. The master plan envisages an increase of 588 billion cubic metres in the quantity of reused water by 2030.²³²

Professor Turton wrote in 2012 that the recovery of usable water from sewage would become “the foundation of a recycling economy driven by stewardship programmes in which water of different qualities and different costs will be used for different purposes”.²³³ In 2019 he said that South Africa’s wastewater treatment works were producing more than 5 billion litres of waste daily. A small amount of this was treated to safe standards, but 4.3 billion litres of untreated or partially treated sewage was discharged back into the country’s rivers. This could very easily be targeted and 70% of that water recovered. This would work out at 1.825 billion cubic metres a year. Professor Turton had earlier written that if the country’s sewage plants were upgraded and operated properly, they could yield 5 billion litres of safe water every day which, with “next-generation” technology, could become drinking water.²³⁴



In 2019 he said that South Africa’s wastewater treatment works were producing more than 5 billion litres of waste daily. A small amount of this was treated to safe standards, but 4.3 billion litres of untreated or partially treated sewage was discharged back into the country’s rivers.

A new paradigm

Four years later Professor Turton was urging the adoption of what he called a “new paradigm”. He said that Cape Town’s “Day Zero”, when all the water would run out, assumed a “paradigm of scarcity”. Water, however, was “an infinitely recyclable and renewable resource”, and South Africa needed a new “paradigm of abundance”. A recycling water economy would attract significant technology and investment. There was a big appetite to invest and South Africa also had the skills for it. “There is no limit to the amount of capital. There is the technology. What is missing is policy certainty and the mechanism to engage the state”.²³⁵

Given the financial constraints which the government faces, private investment in the water sector is essential. But it would require adequate security for investors, reasonable rates of return, and the opening up of opportunities for risk-taking, profit-seeking, private investors, both local and foreign. And, of course, the elimination of corruption.

There is another problem. Says Professor Turton, “The paradigm of scarcity, based on the notion of water as a stock, has so shaped thinking that the current technocrats [in the DWS] are simply unable to grasp the fact that water is a flux and thus infinitely renewable.” As a result, the DWS “is unwilling to consider any serious water waste recovery, not even desalination. They don’t understand the technologies and fear a public backlash.”²³⁶

Reconfiguration of supply

If the additional quantities of water from each of the four main augmentation sources come about as envisaged by the DWS, and if its plans to reduce losses and demand are implemented, then the period between 2015 and 2030 will see the contribution of surface water to total supply drop from 71.24% to 67.89%.

The contribution of groundwater will increase from 18.65% to 18.97%, the contribution of reused water from 9.46% to 11.97%, and the contribution of desalinated water from 0.65% to 1.26%. Off low bases, the contributions of “manufactured” water will rise the most. By 2040 there would be an increase of almost 60% in the amount of reused water and one of 233% in the amount of desalinated water in use.²³⁷ Even so, Professor Turton believes the projected increases in desalinated and reused water are very “conservative”. This is because of the “lack of vision, technical ineptitude, and stereotypical thinking” in the DWS.²³⁸



The contribution of groundwater will increase from 18.65% to 18.97%, the contribution of reused water from 9.46% to 11.97%, and the contribution of desalinated water from 0.65% to 1.26%. Off low bases, the contributions of “manufactured” water will rise the most.

Israel is another country in a water-stressed region and, like South Africa, has to manage its water resources carefully. But their respective sources of water are very different. The above figures show that in 2015 South Africa relied on natural water (surface and ground) for 90% of its supply. Manufactured water (reused or desalinated) provided the other 10%. In the same year natural water (aquifers and the Sea of Galilee) supplied 38% of Israel’s water, while manufactured water (brackish, sewage, and seawater) provided the other 62%.²³⁹ By 2040, according to the “planned shifts” envisaged by the DWS, manufactured water will still supply only 14.64% of South Africa’s water.²⁴⁰

Desalination plants along the Mediterranean are a major source of drinking water for Israel, and the narrowness of the country made it possible to create a national grid for the supply of water. But almost 60% of South Africa’s households live in provinces with no coastline.²⁴¹ This confirms that the recycling of sewage will be more important than desalination as a means of manufacturing water for South Africa.

Purification

As we have already seen, the problems facing the Vaal in South Africa were neglected and/or ignored before steps were taken to deal with them. Although some water specialists believe the problems have been exaggerated by environmental lobbies,²⁴² fixing them will be a major achievement. But, as already shown, eutrophication is a problem in most of the country’s dams and elsewhere. Dealing with it needs to become a national priority both in its own right and also as a means of augmenting the country’s water supply. The DWS noted that it was “generally cheaper to treat water at the point of discharge, where the pollution is still relatively concentrated and hence contained, than to treat [it] once the pollution has dispersed into a larger water body and mixed with multiple other pollutant types”.²⁴³ According to one of South Africa’s leading water specialists, the know-how to remove pollutants exists. The problem, as with so much else, is “implementation”.²⁴⁴

Delivery to poor communities

As the first chapter of this paper observed, while temporary water crises in Cape Town and elsewhere can be overcome, many communities in South Africa suffer from chronic water shortages, interruptions in supply, and contamination problems on a daily basis. These, like the problems in cities such as Grahamstown, are not technical problems but problems of governance. We have already noted that one leading South African water specialist says that there is no technical or economic reason why poor communities should not have reliable water.²⁴⁵

Financial sustainability

In its 2018 master plan, the DWS said that the water and sanitation sector was “not financially sustainable”, and that the “poor profitability of water” was at the heart of its financing problem. There were “five legs” to the financial sustainability issue. They were to implement accurate billing and effective revenue management systems and a strict “no payment = no water approach”; making conditional grants dependent on the meeting of current payments; providing for a national entity to take over water service functions of municipalities that could not themselves deliver; raising sufficient revenue through tariffs and grants, with cross-subsidisation of the indigent; dealing with accumulated debt; and “rolling out ring-fenced institutional models to increase private sector investment”.²⁴⁶

Private sector

In its master plan for South Africa, the DWS says that the “growing crisis” in the water sector” is beginning to encourage decision-makers to see private sector participation as a pragmatic and beneficial response”. The sector would always have a social impact, and without water “no economic development can take place”. Funders required “bankable projects” and they had “indicated the need for an enabling environment to mobilise larger private sector investment”. A necessary “immediate action” was for “political leadership to promote investor confidence”.²⁴⁷

A “completion date” of 2025 has been set for the investigation and promotion of “alternative service delivery models such as BOTT (build, operate, train, and transfer) management contracts and concessions”.²⁴⁸ A completion date of 2030 has been set for the development of “bankable projects” for increasing the supply of water. But otherwise the 130 planned “key actions” of the DWS’s master plan give little information as to what role private investment might play.²⁴⁹

According to Mr Le Roy, unlocking private capital to finance the R1 trillion required in investment in the water sector does not necessitate denationalising water, but it does mean policy certainty instead of threats of expropriation without compensation. It also requires the establishment of appropriate special purpose vehicles. One idea is to establish “independent water producers” following the model of “independent power producers” already in use in producing energy and selling it to Eskom. Such independent water producers could be used for desalination as well as for wastewater treatment, he says.²⁵⁰

The “renewable energy independent power producer procurement programme” has mobilised more than R200 billion in private sector investment.²⁵¹ Leon Campher, CEO of the Association for Savings and Investment South Africa, said the R200 billion proved the willingness of the savings sector to invest in properly conceived, planned, and managed projects. “Billions and billions” were available for infrastructure development, but outside the renewables sector suitable projects were thin on the ground.²⁵²

In March 2019 Water Shortage announced that it had managed to get water elevated to a national priority sector in the new Public-Private Growth Initiative (PPGI) established jointly by a group of private sector leaders and the government. Mr Le Roy of Water Shortage said that the traditional rainfall, surface, and groundwater capture paradigm was outdated and had to be replaced by one of Abundance. “We can now work towards mitigating a water shortage crisis that would be far more catastrophic than the current energy crisis. And we must stop talking about South Africa as a water scarce country, because this discourages tourism and investment. We must add a new water chamber.”²⁵³ The new “water chamber” within the PPGI, added Professor Turton, “aimed to create the enabling environment for the deployment of private capital and world-class technology to unlock the value of water as an economic enabler. Water flows uphill to power and money. That is how it works. Get that sorted out and technology and capital will come to the party”.²⁵⁴

Instead of being a constraint upon development that would deter investment, water in the new paradigm of abundance for South Africa would become an economic enabler, so that investment into water recovery and recycling infrastructure was something that would show a return over time. This would be in the form of “job creation, fair wages, inflow of investment because of the reasonable prospect of growth, and a steady increase in taxes from successful companies and gainfully employed individuals”. Taken to its logical but extreme conclusion, this could become the equivalent of the American “new deal”²⁵⁵.

Conclusion

According to the DWS’s master plan for South African water, “If the targets of reducing physical losses in municipal systems are reached, as well as a reduction in the per capita consumption to the global average, in addition to the surface and groundwater supplies, and desalination, reuse, and treated acid mine drainage, there will be a slight surplus available in 2030”.²⁵⁶ That, of course, is a very big “if”.



According to the DWS’s master plan for South African water, “If the targets of reducing physical losses in municipal systems are reached, as well as a reduction in the per capita consumption to the global average, in addition to the surface and groundwater supplies, and desalination, reuse, and treated acid mine drainage, there will be a slight surplus available in 2030”.

Whether the targets can be achieved depends less on technology than on getting governance and policy right. The problems afflicting South Africa’s water supply, set out in the first chapter of this paper, will be extremely difficult to overcome unless the government can be persuaded to take the necessary political decisions to fix governance and policy. How that can be achieved is beyond the scope of this paper, but one key factor will be independent regulators. Another will be to create the appropriate institutional structure. A further component will be to enlist not only technology from the private sector but also investment. This of course brings us back to the institutional, regulatory, and pricing structure, but also to politics.

Endnotes

1. *BusinessDay* 25 October 2018.
2. *Sunday Times* 28 September 2014, *The Times* 29 September 2014.
3. *Daily Maverick* 9 July 2014, *City Press* 13 July 2014, *Saturday Star* 4 October 2014.
4. *The Times* 16 January 2014, *Mail & Guardian* 23 to 29 January 2014.
5. *BusinessDay* 10 March 2017, 13 April 2017, 30 May 2019, *Financial Mail* 21 June 2018, *FinWeek* 16 August 2018. It was reported in May 2019 that the public protector had confirmed that Ms Mokanyane was facing complaints that she had been involved in the awarding of multiple irregular tenders. With regard to one project, Professor Mike Muller said that it appeared that her “priority is to get her hands on the construction funds”.
6. Section 27 of the Constitution states that “everyone has the right to have access to... sufficient food and water”.
7. *BusinessDay* 11 July 2012, *Business Report* 11 July 2012.
8. Department of Water and Sanitation: National Water and Sanitation Master Plan, October 2018, pages 9 and 10 (DWS 2018).
9. DWS 2018 Vol 2, Plan to Action Version 4.2 (DWS Vol 2) page 3–42. A 2005 study showed that South Africa had a total national water resource of almost 60 billion cubic metres in non-drought years, some 83% of it as annual run-off and the balance in the form of utilisable ground water exploitation potential. However, this is not all available for consumption as water must be left in rivers and elsewhere to sustain aquatic ecosystem health. Anthony Turton: Understanding Water as a Strategic Risk, 21 October 2010 (Turton 2010), and email communication to the writer 12 July 2019.
10. *Prime Africa Consultants for the Water Research Commission (WRC): National Water Accounts for South Africa – Systems, Methods, and Initial Results* (WRC report number TT 774/18), March 2018, pages vi–vii.
11. Figures quoted in IRR: *South Africa Survey* 2019 (Survey), page 393.
12. Jacob Zuma: State-of-the-Nation address, 9 February 2017.
13. DWS: National Water Resource Strategy (NWRS), 2013, page 9.
14. Donnenfeld et al: A Delicate Balance – Water Scarcity in South Africa, Institute for Security Studies, March 2018 (ISS) page 8.
15. DWS 2018 page 61.
16. *The Economist* 2 March 2019.
17. World Wildlife Fund SA: *Water: Facts and Figures – Rethinking South Africa's Water Future*, Cape Town, May 2016 (WWF 2016), page 85; World Wildlife Fund for Nature: *The Water Files – Communicating in a Time of Water Crisis*, Cape Town, July 2018 (WWF 2018), page 4.
18. WWF 2018 page 5; DWS Vol 2 pages 8–1, 8–2.
19. Anthony Turton: Unpublished Private Memoir, 2019 (Turton 2019); Turton 2010.
20. *The Star* 9 March 2018.
21. *The Citizen* 26 February 2018.
22. DWS 2018 page 9.
23. WWF 2016 pages 3, 36.
24. ISS page 2.
25. DWS Vol 2 page 3–10.
26. ISS page 3.
27. NWRS 2013.
28. *BusinessDay* 31 August 2018.

29. DWS Vol 2 page 3–13, WWF 2018 page 6, WWF 2016 pages 20, 35, 39.
30. DWS Vol 2 page 3–11.
31. Turton 2019.
32. DWS 2018 page 34.
33. *Sunday Times* 29 June 2014, *Financial Mail* 9 to 15 October 2014.
34. *Survey* pages 765,770.
35. DWS 2018 page 2.
36. DWS Vol 2 pages 5–1, 5–2, 5–5, 17–4.
37. WRC pages vi–vii.
38. Anthony Turton: Water Pollution and South Africa's Poor, IRR, November 2016 (Turton 2016) page 5.
39. DWS 2018 page 2.
40. ISS page 18.
41. Turton 2016 page 5.
42. *BusinessDay* 30 August 2018.
43. DWS 2018 page 12.
44. *Survey* page 27.
45. *Survey* page 750.
46. *Financial Mail* 3 August 2012.
47. *FinWeek* 16 August 2018.
48. National Treasury 2019: *Budget Review* page 140.
49. DWS 2018 page 49, email from Mr Le Roy 14 July 2019.
50. DWS Vol 2 page 12–9.
51. Stats SA data cited by DWS 2018 page 19.
52. DWS 2018 Vol 1 Call to Action (DWS Vol 1) page 26.
53. *Farmer's Weekly* 11 May 2012, Section 2 of the Act.
54. Anthony Turton: Sitting on the Horns of a Dilemma – Water as a Strategic Resource in South Africa, IRR, November 2015 (Turton 2015), pages 2–5.
55. *Farmer's Weekly* 17 March 2017.
56. DWS 2018 pages 10, 17.
57. *BusinessDay* 21 November 2018.
58. *The Star* 9 March 2018.
59. *Farmer's Weekly* 18 November 2016.
60. *The Citizen* 26 February 2018.
61. *Survey* pages 781, 232.
62. DWS 2018 page 21.
63. DWS Vol 2 pages 9–1, 9–2. In 2013 the number of water management areas was reduced from 19 to 9. However, only two of the catchment management agencies (CMAs) to oversee these areas had been established by 2018.
64. John Kane-Berman: From Last Grave at Dimbaza to Three Tiny Graves at Bloemhof (Dimbaza), IRR, June 2014 (Kane-Berman 2014). See also numerous publications by the IRR, the IRR website, and Politicsweb.
65. *BusinessDay* 5 July 2019.
66. *Mail & Guardian* 15 to 21 March 2019.
67. *BusinessDay* 30 May 2019.
68. Email to writer 10 July 2019.
69. *BusinessDay* 30 October 2017, the messenger.global 13 December 2017.
70. *BusinessDay* 30 August 2018.
71. *The Citizen* 17 August 2018.
72. *Saturday Star* 1 September 2018.
73. *Sunday Times* 2 December 2018.
74. *Saturday Star* 6 April 2019, *Financial Mail* 18 October 2018.
75. *BusinessDay* 12 September 2018.
76. *The New Age* 16 August 2013.
77. *Politicsweb* 26 February 2019.
78. *Sunday Times* 5 May 2019.
79. *Mail & Guardian* 15 to 21 February 2019.
80. *The Citizen* 15 May 2019.
81. *BusinessDay* 5 July 2019.
82. *The Citizen* 18 February 2019.
83. *The Citizen* 27 March 2019.
84. *Saturday Star* 3 November 2012.

85. *Sunday Times* 20 January 2013.
86. *The Citizen* 27 March 2019.
87. WWF 2016 page 66.
88. *The Citizen* 24 April 2019.
89. *Sunday Times* 14 April 2019.
90. *BusinessDay* 29 May, 25 June 2019, Moneyweb 3 June 2019.
91. *The Times* 10 September 2015.
92. *City Press* 5 April 2015.
93. *The Citizen* 28 March 2019.
94. *Daily News* 25 April 2019, *The Citizen* 13 May 2019, *BusinessDay* 15 May 2019, *Sunday Times* 30 June 2019.
95. *The Citizen* 4 September 2014.
96. *Sunday Times* 11 November 2018.
97. *BusinessDay* 18 November 2016, *The Citizen* 28 March 2019, Turton 2015 page 5.
98. *Survey* pages 768–769.
99. *Sunday Independent* 3 March 2013, *Saturday Star* 4 January 2014.
100. *The Citizen* 27 March 2019.
101. *The Citizen* 5 April 2019.
102. WWF 2016 pages 26, 53.
103. DWS 2018 pages 30, 35.
104. Turton 2015 page 14.
105. Turton 2015 page 14.
106. *Farmer's Weekly* 23 October 2015, *The Citizen* 17 August 2018, Turton 2015 page 13.
107. Turton 2016 page 8.
108. *Saturday Star* 6 January 2018.
109. Turton 2016 page 13.
110. *Saturday Star* 23 March 2019.
111. *BusinessDay* 18 July 2012.
112. John Kane-Berman: Mining and People – The Impact of Mining on the South African Economy and Living Standards, IRR, February 2018 (Kane-Berman 2018), page 32.
113. *Mail & Guardian* 17 to 23 May 2019.
114. *Financial Mail* 21 June 2018.
115. *Saturday Star* 22 September 2018.
116. Turton 2019 passim.
117. Turton 2016 page 3.
118. DWS 2018 page 43.
119. *The Citizen* 1 February 2014.
120. *Sunday Times* 29 June 2014, *Financial Mail* 9 to 15 October 2014.
121. *The Star* 4 February 2013.
122. *Businesslive* 30 January 2018.
123. *Business Report* 8 May 2018, *BusinessDay* 11 December 2018, *Financial Mail* 14 to 20 February 2019.
124. *BusinessDay* 19 July 2018, 11 September 2018.
125. *Mail & Guardian* 15 to 21 March 2019.
126. *Daily Maverick* 14 February 2019.
127. *Sunday Times* 28 September 2014, *The Times* 29 September 2014.
128. *Financial Mail* 21 June 2018.
129. *Mail & Guardian* 15 to 21 March 2019.
130. *Mail & Guardian* 16 to 22 March 2012.
131. *The Star* 3 April 2019.
132. *City Press* 12 February 2017, *BusinessDay* 25 October 2018.
133. *BusinessDay* 17 October 2018.
134. *Survey* page 236.
135. *BusinessDay* 19 September 2018.
136. Speech during his departmental budget vote 14 May 2018.
137. *BusinessDay* 10 April 2018.
138. *Financial Mail* 3 August 2012.
139. *Financial Mail* 21 June 2018.
140. Turton 2015 page 17.
141. John Kane-Berman: Transformation and the Constitutional Court, Afriforum, October 2018, pages 4, 6.

142. *Financial Mail* 20 June 2014.
143. Turton 2015 page 17.
144. Turton 2019.
145. *BusinessDay* 17 October 2014.
146. *BusinessDay* 12 December 2017.
147. DWS 2018 page 17.
148. DWS Vol 2 pages 4–1,4–2.
149. *FinWeek* 16 August 2018, *Mail & Guardian* 15 to 21 March 2019.
150. Green Cape: Market Intelligence Report 2019, pages 19–20; Rolfe Eberhard: Administered Prices – Water, A report for National Treasury, undated.
151. DWS 2018 pages 26, 39.
152. WRC page viii.
153. DWS 2018 pages 2, 10.
154. *Financial Mail* 3 August 2012.
155. *Financial Mail* 9 to 15 October 2014.
156. Kane-Berman 2014.
157. *Sunday Times* 4 December 2016.
158. *Sunday Times* 29 June 2014.
159. *Financial Mail* 3 August 2012.
160. *Financial Mail* 20 June 2014.
161. DWS Vol 2 pages 9–3, 11–3, 11–4, 11–5,11–6.
162. *FinWeek* 16 August 2018.
163. *BusinessDay* 12 January 2018.
164. *BusinessDay* 12 December 2017.
165. Email to writer 3 July 2019.
166. *Saturday Star* 6 April 2019, *The Citizen* 9 April 2019.
167. Email to writer 3 July 2019.
168. DWS 2018 page 31.
169. Readers are referred to the IRR's website, to Politicsweb, and to BizNews for some of the numerous papers and articles published by the IRR and/or written by its policy analysts.
170. Interview with the writer 28 May 2019.
171. DWS 2018 pages 39–40, DWS Vol 2 page 5–23.
172. Interview 24 May 2019.
173. DWS Vol 2 page 6–5.
174. Interview.
175. DWS 2018 page 8.
176. DWS 2018 page 60.
177. DWS Vol 2 page 12–29.
178. DWS 2018 page 31.
179. DWS Vol 2 pages 5–23.
180. As at 30 June 2018 some R116 billion had been owing to municipalities for more than 90 days. As noted in the first chapter of this paper, almost R36 billion was for water, three times as much as was owed for electricity. *Survey* 2019 page 236.
181. DWS Vol 2 pages 12–29, email to writer 14 July 2019.
182. Interview 28 May 2019.
183. DWS 2018 pages 56–57.
184. Interview.
185. *Engineering News* 12 April 2017.
186. Seth Siegel: *Let There be Water – Israel's Solution for a Water-Starved World*, Thomas Dunne Books/St Martin's Press, New York, 2015, page 157.
187. Turton 2019, emails to writer 11, 12 July 2019.
188. *BusinessDay* 5 February 2018, *Financial Mail* 25 April 2019.
189. DWS Vol 2 pages 7–10.
190. DWS Vol 1 page 63.
191. Interview 24 May 2019.
192. WWF 2016 pages 48, 64.
193. *BusinessDay* 5 July 2019.
194. *Saturday Star* 22 September 2018.
195. DWS 2018 pages 8, 12.

196. DWS Vol 2 pages 3–48.
197. Interview 28 May 2019.
198. Email communication with the writer 3 June 2019, telephone communication with the writer 18 June 2019.
199. Interview 18 June 2019.
200. *Sunday Times* 7 April 2019.
201. Email communication to the writer 2 July 2019.
202. WWF 2018 page 6.
203. Interview 28 May 2019.
204. DWS Vol 2 pages 3–42.
205. NWRS pages 8, 20, *Financial Mail* 21 June 2018.
206. DWS Vol 2 3–32, 3–41.
207. Interview 24 May 2019.
208. DWS Vol 2 pages 3–42, 3–44, 3–49.
209. NWRS pages 20, 25, DWS 2018 page 9.
210. *Sunday Times* 7 April 2019.
211. WWF 2018 page 11.
212. Interview 24 May 2019, email to writer 14 July 2019.
213. DWS Vol 2 pages 3–17.
214. Interview 31 May 2019.
215. NWRS pages 20, 26.
216. Turton 2015 page 10.
217. DWS 2018 page 11.
218. DWS 2018 page 12, DWS Vol 2 pages 3–42.
219. Email to writer 3 July 2019.
220. *BusinessDay* 2 March 2018.
221. *Noseweek* June 2019.
222. *Financial Mail* 21 June 2018, *Moneyweb* 8 April 2019.
223. Interview 28 May 2019.
224. Interview 24 May 2019.
225. *Business Day* 23 May 2019.
226. Email to writer 3 July 2019.
227. Interview 24 May 2019, John Lang: *Bullion Johannesburg – Men, Mines, and the Challenge of Conflict*, Jonathan Ball, Johannesburg, 1986.
228. Interview 28 May 2019.
229. Turton 2015 page 3, Turton 2019.
230. Interview 24 May 2019.
231. DWS Vol 2 pages 3–15, 3–17.
232. NWRS page 20, DWS Vol 2 pages 3–17, 3–35, 3–42, 3–49.
233. *Business Report* 26 March 2012.
234. Turton 2015, pages 10–11, email to writer 3 July 2019.
235. *themessenger.global* 27 March 2018.
236. Email to writer 10 July 2019.
237. DWS Vol 2 page 3–42.
238. Email to writer 10 July 2019.
239. Siegel page 252.
240. DWS Vol 2 pages 3–42.
241. *Survey* pages 58–59.
242. Interview 28 May 2019.
243. DWS 2018 pages 30–31.
244. Interview 28 May 2019.
245. Interview 28 May 2019.
246. DWS 2018 page 60, DWS Vol 2 pages 12–1, 12–34.
247. DWS Vol 2 pages 12–21, 12–33, 12–34, 12–36.
248. DWS Vol 1 page 22.
249. DWS Vol 1 page 63.
250. Interview 24 May 2019.
251. *Moneyweb* 26 June 2019.
252. *Sunday Times* 20 January 2019.
253. Interview 24 May 2019.
254. Water Shortage South Africa: press release 21 March 2019, email to writer, 3 July 2019.
255. Turton 2019.
256. DWS 2018 page 13.



South African Institute of Race Relations

The power of ideas

2 Clamart Road, Richmond, Johannesburg, 2092 South Africa

P O Box 291722, Melville, 2109 South Africa

t. 011 482 7221

info@irr.org.za | www.irr.org.za