SOUTH AFRICAN INSTITUTE OF INTERNATIONAL AFFAIRS

POLICY BRIEFING 155 NOVEMBER 2016

SOUTH AFRICA'S DROUGHT PREPAREDNESS IN THE WATER SECTOR: TOO LITTLE TOO LATE?

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EXECUTIVE SUMMARY

South Africa experiences droughts on a regular basis, often associated with significant negative impacts on society and the economy. Droughts can be forecast, and South African climate scientists have been developing computer-generated models to forecast El Niño-induced droughts. Even so, there is a tendency to implement remedial interventions when droughts occur, rather than implementing proactive and preventative strategies. Being reactive seems to be a defining feature of South African water-resource management. This has also been the case with the 2015/2016 drought. What is more, the forecasting capability of South Africa seems to be under strain as more and more weather monitoring stations and river gauges are stolen or vandalised and not replaced. This makes it difficult to gather data for extreme weather event forecasting. One way of increasing this capability is through collaboration with citizens to build a citizen-science data repository. This can enhance scientists' and the government's capacity to forecast droughts.

RECOMMENDATIONS

1. South Africa should adopt a long-term, national drought policy and strategy to improve the country's response to future droughts.
2. The computer-generated models that determine operating rules, which influence water restrictions for various users, need regular updating and improvement.
3. The drought response unit of the DWS needs to become more proactive in its preparedness for droughts.
4. A formalised knowledge exchange platform should be established that consolidates scientific and modelling forecasting capability in support of drought preparedness.

INTRODUCTION

The current country-wide drought in South Africa, which is likely to continue into 2017, has raised important questions regarding the country's drought preparedness. There is a general sense that the government, in particular, was not well prepared to respond to the current drought. This criticism is compounded by the fact that South Africa is prone to cyclical droughts at regular intervals; since 1980, the country has experienced four droughts. These droughts varied in severity, but all had a negative impact on the agricultural sector, the country's ability to generate electricity and the broader economy. The current drought is the worst in 35 years. Although one can define drought scientifically (meteorological droughts occur when rainfall is 75% below normal over a one-year period or longer),[2] this does not mean that a drought is a weather-related phenomenon only; it also has a social dimension.[3]

FORECASTING AND RESPONDING TO DROUGHT

The strongest El Niño since 1997[4] has generated the current drought and, as a result, eight of South Africa's nine provinces have been declared disaster areas. Ian Khama, President of Botswana and current chairperson of SADC, declared a regional disaster in July 2016. Southern African countries have appealed for $2.7 billion (ZAR[5] 38.87 billion) in drought aid, reflecting the extent of the drought's socio-economic ramifications.[6]

The El Niño phenomenon is usually associated with below-normal rainfall in Southern Africa and parts of South America and Australia. However, this is not the rule. Between 1997 and 2015 there were four El Niño events, but none generated the severe below-normal rainfall the country is currently experiencing. Climate scientists can only explain 30% of rainfall variability by studying the El Niño phenomenon; therefore other factors should also be considered when forecasting seasonal rainfall. Using computer models, scientists can forecast El Niño events nine months in advance, but it is important to note that such an El Niño forecast should not be narrowly interpreted as a rainfall forecast.[7] Another consideration is that El Niño does not always cause drought in South Africa, in part because the effect of the event is sometimes reduced by sufficient soil moisture and groundwater reserves that are carried over from the previous season.

South Africa has put in place a number of coping strategies and policies to respond to periods of drought. This includes the promulgation of the Disaster Management Act No. 57 of 2002 and the National Disaster Risk Management Framework of 2005. Yet despite the development of these policies, the focus of the South African government still seems to be largely centred around remedial action rather than on preventative mechanisms.

Operationally, the country's bulk water supply system and interconnected water networks play a pivotal role in South Africa's drought response strategy. The Department of Water and Sanitation (DWS) manages the country's system of dams, water pipelines, and irrigation schemes through operating rules, both under normal conditions and during droughts.[8] When a drought occurs, the department prioritises water supply according to the different water-use sectors' requirements to ensure sustainability of the resource.[9] Water-use priority is given to basic human needs and the water requirements of strategic users, such as power stations and major industries. Urban water users are curtailed less than the agriculture sector. Each specific system will therefore have different levels of curtailment, according to the profile of water users reliant on the system. The computer-generated models determining these operating rules need regular updating in response to improved understanding of the system's water resources and the country's water requirements.[10] Additionally, the department's water conservation and demand management programmes constantly engage with municipalities to address the issue of non-revenue water loss (such as water leaks) that can waste up to 40% of the bulk water supply in large municipalities.[11]

Implementation of water conservation and water demand management (WC/WDM) strategies is critically important if South Africa is to overcome the effects of drought at the municipal level. Despite the fact that WC/WDM is a critical element in all strategies to balance water supply and demand, many municipalities have not fully adopted the water conservation ethos. Indeed, some municipalities are not aware of their exact water use and/or water losses due to a lack of monitoring information on water use and backlogs in water infrastructure maintenance.[12] At the household level, South Africans use more water than many other developed and developing countries. Water is often wasted, even during times of drought. About 40% of urban household water is used for watering gardens.[13] An effective drought policy needs to address individual water-use habits on a continuous basis, rather than focusing predominantly on the introduction of water restrictions in various water-use sectors when a drought occurs.

At the national level there is still a gap between scientists' ability to model the incidence of drought and the incorporation of this information into government and sectoral responses. Both the government and the agricultural sector were aware of forecasts, in 2015, of significantly below-normal rainfall and were not completely unprepared. What was unexpected was that this El Niño would be the strongest since 1997 and that the below-normal rainfall it would cause would be the lowest in more than 90 years. The below-normal rainfall (meteorological drought) led ultimately to a hydrological drought, where the lowest reservoir levels were observed in a decade and the deficiency in soil moisture posed a significant threat to livelihoods and food security.

There is a growing realisation that South Africa requires a long-term, national drought policy and strategy to mitigate the risk of future occurrences of drought. Embedded within this is the need for regular science-based mechanisms and monitoring that will deliver timely information to decision-makers and so strengthen risk management measures and preparedness plans.

SOUTH AFRICA'S DROUGHT PREPAREDNESS

The South African Weather Service (SAWS) issues drought warnings, while the Applied Centre for Climate and Earth Systems Science and institutions such as the Council for Scientific and Industrial Research (CSIR) are also capable of giving ample warning of probable droughts. The CSIR's Dr Francois Engelbrecht indicated in October 2015 that South African 'farmers are used to a high degree of climate variability. It is not the first time they have faced El Niño.'[14] Engelbrecht observed that the commercial farming sector is quite sophisticated in gathering information on weather patterns. However, farmers who have been experiencing dry spells for three consecutive years are vulnerable to a major El Niño-induced drought. This places added pressure on commercial farming operations, and even more for subsistence farming.[15]

To address the issue of drought preparedness it is necessary to implement collaborative governance spanning the government, major water-use sectors and the broader citizenry.[16] A number of tactics can be employed, one of which is adequate drought monitoring. The DWS has a number of drought plans in place that are operationalised through the mobilisation of various teams. Water resource development teams that site and drill boreholes for short- to medium-term needs are a case in point. The department's Drought Management Unit monitors droughts and floods before, during and after such events occur. However, this unit operates largely in a reactive manner, providing remedial action as opposed to implementing a proactive, long-term strategy. Long-term strategies include the assessment of the use of groundwater resources, where it is sustainable, to augment water supply. Water conservation and awareness projects should also be expanded. On the supply side, the refurbishment, operation and maintenance of bulk water supply systems and water distribution systems need to be improved. It is also important to improve weather forecasting and confidence levels in predicting extreme events. Investments in research and technology developments are essential in this regard. Co-operation between various science and technology organisations such as SAWS, the CSIR, the Water Research Commission (WRC) and universities is needed to enhance the efficiency of climate protection tools and climate model scenarios.[17]

A major challenge for South Africa's meteorological data gathering system is the theft and vandalisation of weather monitoring stations. This undermines the country's weather monitoring system, making it more difficult to gather essential data for forecasting purposes. Rainfall data and streamflow gauges are important elements of meteorological infrastructure to gather data and operate an effective flood and drought early warning system. There is also a shrinking budget to replace and/or maintain damaged monitoring stations. On top of this, rainfall data, necessary for streamflow assessments, is no longer freely available, but needs to be purchased from SAWS and the Agricultural Research Council, placing a burden on forecasting budgets and hindering climate change research.[18]

One way of addressing the problem of a weakening monitoring system is to engage citizens and gather data from private individuals who keep rainfall records. In 2014 the WRC launched such an initiative and received a significant response. This culminated in a hydrology data service centre from citizens and other private data collectors, developed in collaboration with the Department of Science and Technology, USAID, the US Army Corps of Engineers and the US Bureau of Reclamation. The challenge with data generated through such processes is that it needs to be vetted and verified, which in turn requires a greater allocation of human resources as well as computing power. However, with the appropriate support such programmes hold great promise for enhanced drought preparedness in South Africa and the broader region. Since drought is a regional phenomenon, citizens

across the Southern African region should be included in such initiatives. For such programmes to be effective, however, the service centre needs the necessary resources to process and effectively disseminate the data.[19]

CONCLUSION

The current, country-wide drought is not a once-off event, and preparedness for such natural disasters, which are usually followed by La Niña-related flooding across Southern Africa, is essential. South Africa has been ravaged by drought before and this natural phenomenon will happen again. It is not a matter of 'if' but 'when', and broadening monitoring capability, including through citizen participation, can contribute to improved preparedness. In this regard, the DWS should enlarge the scope of the Drought Management Unit to include the effective forecasting of other natural disasters, such as flooding, as well. This unit could also engage the citizenry more proactively, rather than focusing on the scientific and policy community. In this way, the governing capacity of the department could increase immensely, contributing to enhanced drought preparedness at the national level.

ENDNOTES

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2 SAWS (South African Weather Service), 'What is a drought?', http://www.weathersa.co.za/learning/climate-questions/41-what-is-a-drought, accessed 12 August 2016.
3 Wilhite DA & M Buchanan-Smith, 'Drought as hazard: Understanding the natural and social context', in Wilhite DA & M Buchanan-Smith (eds), *Drought and Water Crises: Science, Technology, and Management Issues*. London: Taylor and Francis, 2005, pp. 3–32.
4 National Oceanic and Atmospheric Administration, 'What is El Niño?', http://www.pmel.noaa.gov/elnino/what-is-el-nino, accessed 12 August 2016.
5 Currency code for South African rand.
6 *Fin24*, 'El Nino-hit southern Africa seeks nearly R39bn in drought aid', 13 July 2016, http://www.fin24.com/Economy/el-nino-hit-southern-africa-seeks-nearly-r39bn-in-drought-aid-20160713, accessed 15 October 2016.
7 SAWS, 'How does ENSO affect South Africa', 12 August 2016, http://www.weathersa.co.za/learning/climate-questions/35-how-does-enso-affect-south-africa, accessed 15 October 2016.
8 Van Vuuren L, 'Water resource management: Drought management – strengthening our knowledge armoury', *The Water Wheel*, 14, 6, 2015, pp. 14–17.
9 Personal communication, Dr Chris Moseki, DWS, 18 August 2016.
10 Van Vuuren L, *op. cit*.
11 Personal communication, Prof. Michael Savage, University of KwaZulu-Natal, 8 September 2016.
12 Mckenzie R, Siqalaba ZN & WA Wegelin, *The State of Non-Revenue Water in South Africa (2012)*. Pretoria: Water Research Commission, 2012.
13 Personal communication, Ashwin Seetal, CSIR (Council for Scientific and Industrial Research), 12 September 2016; Aquarista, 2010, 'Typical household water consumption', http://www.capewatersolutions.co.za/2010/02/06/typical-household-water-consumption/, accessed 15 October 2016.
14 Areff A, '2015 going to be the warmest year on record – SA researcher', *News24*, 30 October 2015, http://www.news24.com/SouthAfrica/News/2015-going-to-be-the-warmest-year-on-record-researcher-20151030, accessed 14 October 2016.
15 Personal communication, Dr Francois Engelbrecht, CSIR, 12 August 2016.
16 Personal communication, Dr. Chris Moseki, DWS, 18 August 2016.
17 *Ibid*.
18 Personal communication, Prof. Michael Savage, University of KwaZulu-Natal, 8 September 2016.
19 Personal communication, Wandile Nomquphu, Water Research Commission, 17 August 2016.

ACKNOWLEDGEMENT

This publication forms part of the project Climate Change Adaptation Readiness: Lessons from the 2015/2016 El Nino for Climate Readiness in Southern Africa, funded by the Embassy of the Federal Republic of Germany in Pretoria.