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South Africa and the drought that exposed a young democracy

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Abstract

South Africa is a young democracy currently going through a crisis of leadership. The worst drought in recorded history has played out at regional level but against the backdrop of complex political dynamics. The government has lost significant capacity at the technical level, largely the result of political priorities driven by the need to decolonise society and the institutions of higher learning. This has manifest in the water sector as systemic failures of key instrumentation systems, rendering the El Niño event invisible until it hit. This case study of the El Niño event shows that drought management is embedded within a broader political process and is not simply a technical management issue. The Vaal River system sustains 60% of the national economy and 45% of the total population of the country, but water security in this system has been placed at risk because of political dynamics.

Keywords: DDT; Decolonization of science; El Niño; Indian Ocean Dipole; Inter-Tropical Convergence Zone; Instrumentation; Patronage; South Africa; Urogenital birth defects

Introduction

> '*Southern Africa's worst drought in decades has left 40 million people, 14 per cent of the region's total population, food insecure this year. The World Food Programme is significantly scaling up operations to reach over 13 million by January 2017, but funding shortfalls remain acute: the Southern African Development Community estimates a gap of $2.5 billion*' (CSIS, 2016).

South Africa, as but one country in southern Africa, is an anomalous place: economically diversified beyond its natural water endowment and with the largest city in the world not on a river, lake or

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waterfront – Johannesburg – straddling a continental watershed divide (Turton *et al.*, 2006). This means that economic development is clustered around one major river basin (the Orange/Vaal) and the well-being of an entire nation rests in the hands of a highly competent technocratic elite. Water security at both the national and regional level is a core strategic issue (Oosthuizen *et al.*, 2015). Drought is a natural occurrence with the essence of strategic water resource planning being the mitigation of the impact of the next event (Middelton & Bailey, 2008). Hydrologically the country is squeezed between four major planetary systems – the El Niño Southern Oscillation (ENSO), the frontal systems of the Southern Ocean, the Inter-Tropical Convergence Zone and the Indian Ocean Dipole. This paper delves into the politics and decision-making processes that have been exposed by the 2015/16 El Niño event, which is the worst in recorded history. Analytically, three independent drivers will be assessed in order to gain a deeper understanding about drought management in a young democracy that is currently in crisis (Feinstein, 2007; Johnson, 2015). The policy-related linkages between hydrological reality and the legitimate aspirations of a nation with a long history of oppression and abuse by political elites will be examined.

Drivers of the 2015/16 El Niño water resources drought disaster

It is logical to assume that policy experiments take place in a young democracy and in this regard South Africa is no exception. After all, a liberation movement that fought for almost a century faces a different set of challenges when it becomes the party of government. In order to understand how the broad policy positions have played out since the advent of democracy in 1994, we can see three distinct phases, each different from the others in a fundamental way, but also linked directly to the executive leadership at a given moment in time. By understanding these policy dynamics, we can assess the degree to which the impact of the current drought is a human-induced disaster by virtue of the politicization of water resource management decisions.

Driver 1: overarching political dynamics

The history of apartheid is well documented so little needs to be said here apart from the fact that the desire for liberation from oppression is universal and deeply rooted in South Africa (Johns, 1989; Karis & Carter, (1972); Liebenberg, 1994; Meredith, 2007; Simpson, 2016). The transition to democracy took place in 1994 when a negotiated peace emerged from the inability of either side to gain a military victory (Gottschalk, 1994; SASS, 1996; Spitz & Chaskalson, 2000). For the purposes of this analysis, three phases are considered since the democratic transition in 1994, each driven by a different executive president.

The first phase of democracy is directly associated with Mandela (1994). Highly acclaimed for his leadership and wisdom, his term in office is associated with the redrafting of all legislation in order to align the new democratic order with the Constitution (1996). This was followed shortly afterwards by the National Water Act (1998), which separated water rights from land rights as a key element of land redistribution (Movik, 2008). This is important, because the African National Congress (ANC) came into existence as a liberation movement in response to the 1913 Land Act that gave the majority of land to persons of European origin, while reserving small tracts of land held under tribal authority in what became known as Bantustans (Giliomee, 1981; Liebenberg, 1994). This was the genesis of

Apartheid, so the linkage between water and land was fundamental to this policy reform (Reed & de Wit, 2003; Funke *et al.,* 2007). The National Waste Management Act (1998) and the National Waste Management: Air Quality Act (1998), were both radical departures from previous policy that had evolved to protect strategic industries in the face of comprehensive economic sanctions (Findlater *et al.,* 2007). These reforms in waste management reversed the externalization of liabilities that had been used to sustain the Apartheid state (Gutteridge, 1984; Adler *et al*., 2007).

This era of legislative and policy reform was driven by charismatic leaders of the armed struggle against Apartheid, many of whom were internationally recognized and respected, including Nelson Mandela, winner of the Nobel Peace Prize, and Professor Kader Asmal, an international lawyer, Stockholm Water Prize laureate and winner of the South African Water and Energy Forum prize for outstanding leadership. This era can be summarized by Mandela's emphasis on non-racial nation-building and the deepening of democracy under the popular banner of the Rainbow Nation (a phrase coined by another Nobel laureate, Archbishop Desmond Tutu). In summary, this period was driven by leaders of enormous integrity with a vision of reconciliation for a country that had emerged from a 350-year history of oppression, violence and bigotry (Meredith, 2007).

The second phase of democracy is directly associated with Thabo Mbeki (Gevisser, 2007), heir apparent to Nelson Mandela and a second generation freedom fighter (Mbeki, 1984). Thabo Mbeki was educated in exile with a post-graduate degree in development studies from the University of Sussex. A deeply intellectual man, his presidency was associated with two major events. The first was the emergence of the concept of the African Renaissance, which effectively ended all public reference to nation building and the so-called Rainbow Nation. In effect this ended the period of non-racialism noted above. The second was the emergence of a dark period in which western science was shunned as the HIV-AIDS pandemic took hold of the country. Dubbed AIDS Denialism, this period unlocked internal tensions in the ruling ANC party, resulting ultimately in the removal of Mbeki from office during an event known as the Polokwane Conference. Science, perceived to be a western concoction imposed on Africa by colonial powers, became the subject of suspicion, so the ban on the use of DDT for malaria eradication was set aside (Cone, 2009; see also: http://www.southafrica.info/about/health/malaria-190906.htm#.V9P5_cEaJqM) and indigenous treatment for AIDS became government policy (Visser *et al*., 2004; see also: http://www.health24.com/Diet-and-nutrition/Nutrition-basics/Beetroot-garlic-onions-and-Aids-20120721).

The third phase of democracy is directly associated with the consolidation of personal power by Jacob Zuma. Much has been written about the Polokwane Conference, which was effectively a bloodless coup, meted out swiftly with the alleged covert support of the National Intelligence Agency (NIA) (Diakanyo, 2009). The remilitarization of politics has become increasingly apparent by the growing presence of camouflage uniformed members of the ANC militia at political events, sometimes carrying weapons without any attempt by the police to intervene (Hosken, 2016). Zuma is unlike any of his predecessors. He has only limited formal education, rising to prominence as head of intelligence in the armed wing of the ANC (Mkonto we Sizwe – Spear of the People – abbreviated as MK) (Simpson, 2016) with a grassroots political intuition that is legendary. Under his presidency, still in existence at the time of writing, the South African democratic experiment has been put to a series of extreme tests. For analytical purposes, the Zuma phase is characterized by seven major trends or events.

1. The first is the consolidation of political power, which many have labelled a criminalization of the state (Feinstein, 2007; Johnson, 2015; Blair, 2016; CCT, 2016). The liberation movement that

brought democracy to South Africa has effectively been captured by an elite (Munusamy, 2016). This so-called 'state capture' is a central element of many daily newscasts and media outputs. At its core, it is about control over power to entrench the politics of patronage and tribalism, while protecting key collaborators. (February, 2016).

2. The South African Police Service was remilitarized (Dintwe, 2013). The national security paradigm was also changed to one of state security, in which the increasingly embattled political elite need protection from its own citizens (Turton, 2010), bringing the State Security Agency (SSA) in as an instrument of power by replacing the more benign NIA.
3. Zuma's presidency's consolidation of power has engendered racial intolerance and genocidal rhetoric (see http://mg.co.za/article/2010-11-04-motlanthe-malemas-cockroach-comment-bad-manners), both of which are linked to the high levels of xenophobic violence that has marred South Africa during this phase of democracy (Johnston & Wolmarans, 2008; Turton, 2009; Grootes 2011).
4. The AIDS issue has taken an about face, with the denialism of the Mbeki-era being actively swept away, at the same time that President Zuma became embroiled in a rape case that went to court, but drove the alleged victim into exile (Times Live, 2014). The decolonization of science is now playing out as a nation wide student protest in demand for free and decolonised tertiary education that has placed the 2016 academic year in jeopardy.
5. The once proud veterans of the armed struggle are now squabbling. A recent example of this was a court battle against the Chairman of the MK Veterans Association and Deputy Minister of Defence (Kebby Maphatsoe) by the former Chief of Staff of MK, Minister of Intelligence and subsequent Minister of Water Affairs (Ronnie Kasrils) (Mabuza, 2016). This centred on the victim of the Zuma rape trial (noted above), with Kasrils pledging the money awarded by the court to a trust set up to protect the exiled victim, who has subsequently died.
6. The Constitutional Court has affirmed the primacy of the constitution, ruling that Zuma has failed to uphold his constitutional obligations (CCT, 2016; see also: http://cdn.24.co.za/files/Cms/General/d/3834/24efe59744c642a1a02360235f4d026b.pdf). The Constitutional Court has also ruled on the legitimacy of the Public Protector's office, openly flaunted by Jacob Zuma (see https://www.enca.com/south-africa/full-judgment-concourt-ruling-nkandla-matter#). This indicates that the judiciary is still functional and effective despite the many attempts to manipulate it. However, the recently appointed new Public Protector has links to the SSA (Joubert, 2016).
7. Finally, the most significant trend has been the unintended consequence of Zuma's leadership, manifesting as a unification of the plethora of opposition parties, to such an extent that during the 2016 municipal elections, the ruling ANC lost its overwhelming national majority with opposition coalitions taking over all major metropolitan councils.

So how is Driver 1, overarching political dynamics, relevant to water resource management in general, and drought management in particular? To answer this question, empirical data underpinning the technical capacity of the South African state to manage water resources have been examined. While state capture has been taking place, a number of important technical issues have remained invisible from media scrutiny. The first part of this narrative is driven by the emerging suspicion of science as a western machination, most aptly manifested by Mbeki's AIDS denialism (Natrass, 2010), and the dogged determination by the ANC to ignore global evidence regarding human health risks to DDT exposure (Bornman *et al.,* 2005, 2008, 2009; Aneck-Hahn *et al.,* 2007; Cone, 2009). The general disrespect for science is starkly illustrated in the water sector by the number of gauging stations that have been

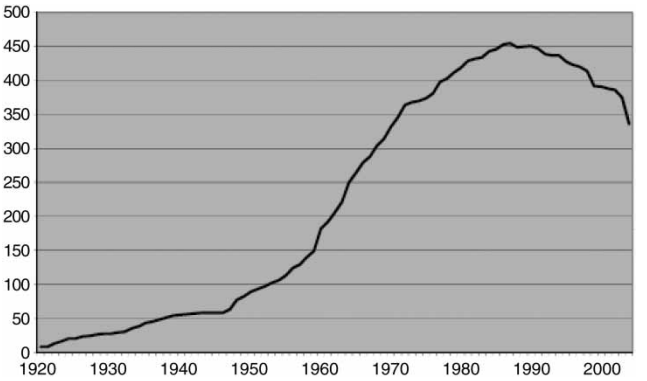

Fig. 1. Number of useful streamflow gauges open each year in South Africa (Pitman, 2011).

functional over time. Figure 1 shows the number of useful stream flow gauging stations while Figure 2 shows the number of rainfall gauging stations that have been functional over time (Pitman, 2011).

Commenting on the data shown in Figure 1, Pitman (2011) notes: 'This figure shows a rapid growth after a relatively slow start before 1960, and then a flattening off to a peak of around 450 in the late 1980s. Since 1990 there has been a steady decline such that the number open in 2004 has dropped to about 350. If this trend continues into the future it will be a serious cause for concern.' With regard to Figure 2, Pitman (2011) said: 'When the use of time series of flow was first adopted in the 1981 survey, the period prior to 1920 was rejected owing to the relative scarcity of stations open before that date. However, we are now in a similar position with the decline in numbers from a high around 1970 to only about half of that in 2004, which is roughly the same number of stations as in 1920. This is a major problem as rainfall is the primary input to WRSM2000 (or any other rainfall runoff model) – not only for simulating runoff but also for calculating irrigation demands and losses from reservoirs and wetlands. Some water management areas (WMAs) are worse off; for example, WMAs No. 4 (Olifants) and No. 13 (Upper Orange) now have less than half the number of stations open than was the case in 1920.'

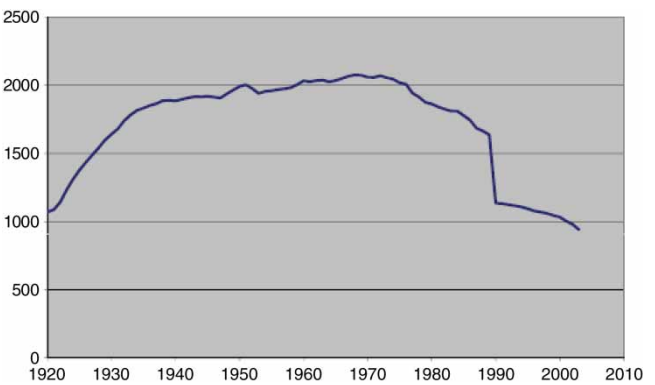

Fig. 2. Number of rainfall gauging stations open each year in South Africa (Pitman, 2011).

In Figure 2, our attention is drawn to the vertical drop in gauging capacity in 1994, when approximately 500 gauges went off line simultaneously. This happened at the same time that a decision was made to disband the Computing Centre for Water Research (CCWR), previously hosted at the University of Natal, and a significant technical resource underpinning a wide range of water resource decision-making platforms. The CCWR used to capture primary data, verify and collate it for onward supply to a range of data users in research, management and regulatory structures. In this one decision, a major element of the technical capacity of the state to manage water, most notably in the capture, storage and processing of metadata, was lost forever. This single event has led to the capture of state data by private consultants, a process exacerbated by the outmigration of technically skilled specialists as the ideological purges began to take hold under Mbeki and accelerated under Zuma.

If we look wider, a similar trend is noted in the capacity of the Council for Scientific and Industrial Research (CSIR) (Walwyn & Scholes, 2006). Figure 3 was part of a review conducted by two senior fellows within the CSIR (Turton, 2008a). The vertical lines show revenues over time, with a peak around 1989. The employee peak of around 5,000 happened in 1988. Therefore, technical capacity was already in decline during the decade before the formal transition to democracy in 1994. This coincides with the external military campaigns, most notably the culmination of Cold War hostilities in Angola that occurred in 1987 with the Battle of the Lomba River (sometimes called the Battle of Cuito Cuanavale) (Steenkamp & Heitman, 2016). It must be noted that the transition to democracy merely culminated in 1994, but actually began in 1987 after the Battle of the Lomba (Turton, 2010). In effect then, the era of science denialism triggered by Thabo Mbeki, merely exacerbated a process already underway and is still playing out as the call by students to decolonize university education.

The same trend is evidenced by the loss of engineering skills. This has become so critical that the South African Institute of Civil Engineers (SAICE) did a presentation to Parliament in 2008, during the transition from Mbeki to Zuma, in which they alerted national policy-makers to the implications of this trend (SAICE, 2008). SAICE's data showed that many of the rural municipalities no longer had a single qualified engineer on their staff, with some of the larger cities also showing a deficit. Furthermore, the outmigration of skilled engineers after 1994, in response to changing employment equity policies, has resulted in the loss of a mentoring cohort capable of guiding new engineers. Similar briefings were given by the CSIR during that period

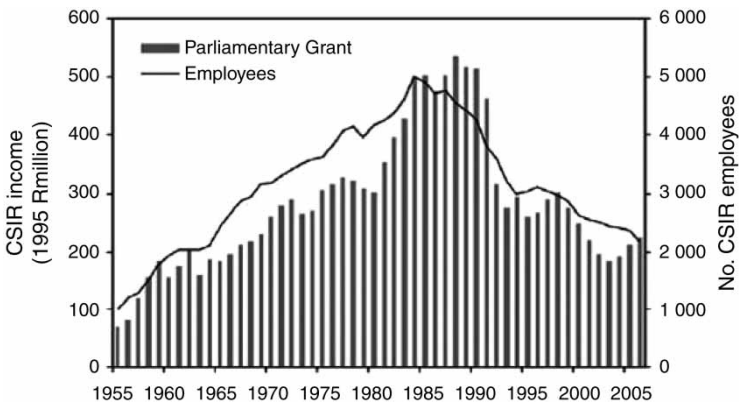

Fig. 3. Number of employees and revenues for the South African CSIR over time (Walwyn & Scholes, 2006).

of great uncertainty (Genthe & Steyn, 2007; Oberholster, 2008; Turton, 2008b) at considerable personal risk to senior scientists making a stand (Nordling, 2008; Power, 2008).

The conclusion regarding Driver 1 (overarching political dynamics) is that there has been a general loss of technical capacity, commencing in 1987 but accelerating under the Mbeki regime's suspicion of science in general, acutely manifest by the reversal on the global position regarding the use of DDT for malaria control. This loss of technical capacity has its origins in the general political environment which has framed the policy debates and driven a range of decisions that have collectively resulted in a loss of resilience in the face of a major drought. While this is understandable, if we accept that the transition from being a liberation movement to becoming a coherent government is challenging, the unfortunate outcome is a human-induced disaster that could have otherwise been avoided, or at least minimized.

Driver 2: climatic reality

Politics is one thing but climate is another indeed. As noted earlier, South African hydrology is driven by major global systems (Schulze, 1990) of which the ENSO is but one (Scholes *et al.,* 2015). Figure 4 shows ENSO data as a deviation from the mean over time (Meissner, 2010).

This dataset shows a number of important trends. First, there is a general cyclical oscillation between positive and negative deviations from the norm over time. Second, a typical trend is an oscillation between a positive and a negative deviation, but this is not always the case when one deviation in a given direction can be followed by another in the same direction. This is unusual however, but not impossible. Third, and most importantly, the peak values on both sides are on a clear upward trend. This is evidence of global warming but also evidence that suggests future events will be more extreme than in the past. These data were used by the author in 2012 (for commercial clients) to predict a major

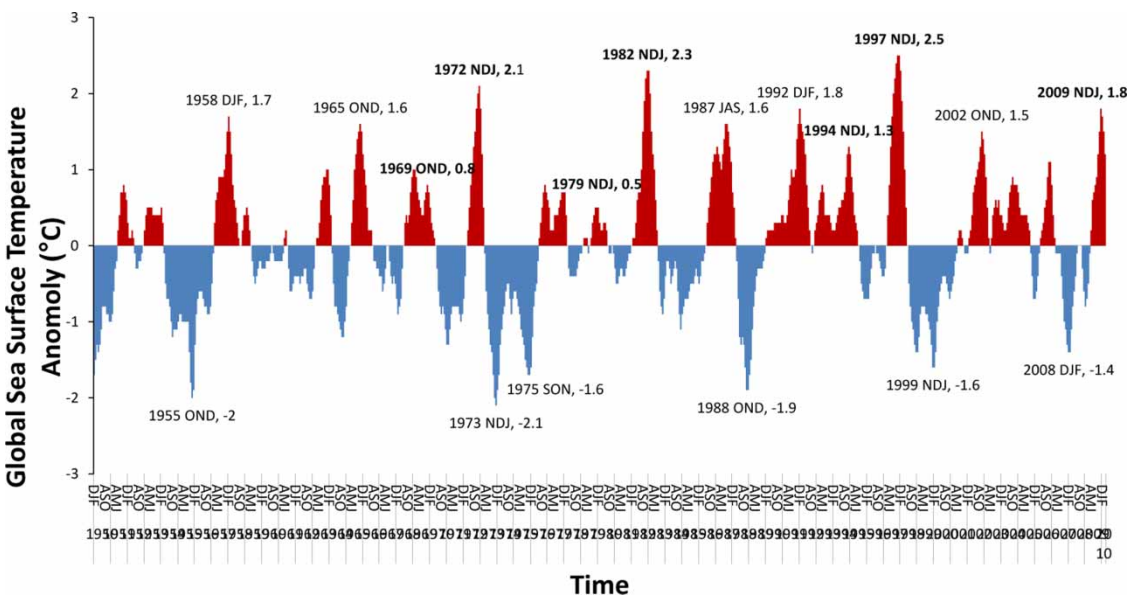

Fig. 4. Global sea surface anomaly for the Pacific Ocean showing El Niño/La Niña events over time (Meissner, 2010).

regional El Niño event 'in the foreseeable future'. This event took place in 2015–16 and was the worst in recorded memory (Crilly, 2016), triggering famine and requiring emergency response at regional level (see http://www.fews.net/southern-africa).

The significance of this El Niño drought event, in the context of government response, is that it remained invisible to government (even though it was known to the CSIR) until it was too late to prepare for it. The rainfall and streamflow gauging stations (shown in Figures 1 and 2) were in such a state of disrepair and the data management systems that they fed into had become so dysfunctional that the El Niño of 2015–16 approached unnoticed. This was best illustrated in the Mvoti River of the Kwazulu Natal (KZN) province.

The Mvoti River supplies water to a large rural community in the iLembe District. Potable water is supplied from a treatment plant that abstracts and treats about 17 Ml/D directly from the Mvoti River. There is no dam for storage. The river carries a heavy silt load and is used by sand miners to harvest aggregate for the construction industry. While some of these sand miners are illegal, not all fall into this category.

In 2014 an employee of the potable water plant run by Umgeni Water sent a report to head office that the water supply had disappeared and that sand miners had diverted the flow of the river. This triggered an aggressive response from the state, with a raid under armed protection, of all legal mining operations. One sand mining operation with lawful mineral rights was served with a directive and told to cease mining immediately.

The mining rights owner, as a legal operation, approached the courts for judgement in their specific case, citing the rapid escalation from *status quo* to enforcement without first going through the customary engagement to determine the level of compliance. The Water Tribunal was dysfunctional and had been abandoned, so the mining rights holder approached the Durban High Court for an interdict (Case number 14236/14 & 14621/14). The High Court ruled that the only legitimate structure capable of hearing such a matter was the Water Tribunal, so they passed an order of court mandating the Minister of Water and Sanitation. This was done in a Cabinet meeting on 15 March 2015 with letters of appointment being signed on 16 June 2015.

In the interim the mining rights holder was being financially prejudiced, because they had been forced to shut down their operation without the chance to engage with the authorities to determine the compliance status (and reasonable actions that might have been needed to ensure full compliance). Their case was based on the logical step of compliance monitoring before the more drastic step of enforcement by shutting down the operation. The matter was heard by the newly reconstituted Water Tribunal, but it was clear that the Chairman was unfamiliar with water resource management principles, and she therefore made specific rulings that effectively reinforced the unilateral decision to shut down the mine.

This meant that the tribunal was forbidden to hear evidence of the lack of cause and effect, because the central allegation was that mining had diverted the flow of the river, which was not supported by any hard evidence. This meant that the logic or legality of compliance monitoring before enforcement through shut-down was not heard. The location and status of gaging stations is shown in Figure 5. There is incomplete information on which management decisions can be made as a direct result of this. The Umvoti River has not had a Comprehensive Reserve Determination Study called for by the National Water Act, so there is no robust scientific data on which to base any management decisions. There is a major El Niño event unfolding, with the catchment of the Hazelmere Dam – the largest water storage infrastructure for the entire KZN North Coast – in the worst drought in 33 years. The dam had insufficient water in it to supply the KZN North Coast until the next rainy season. There was an almost

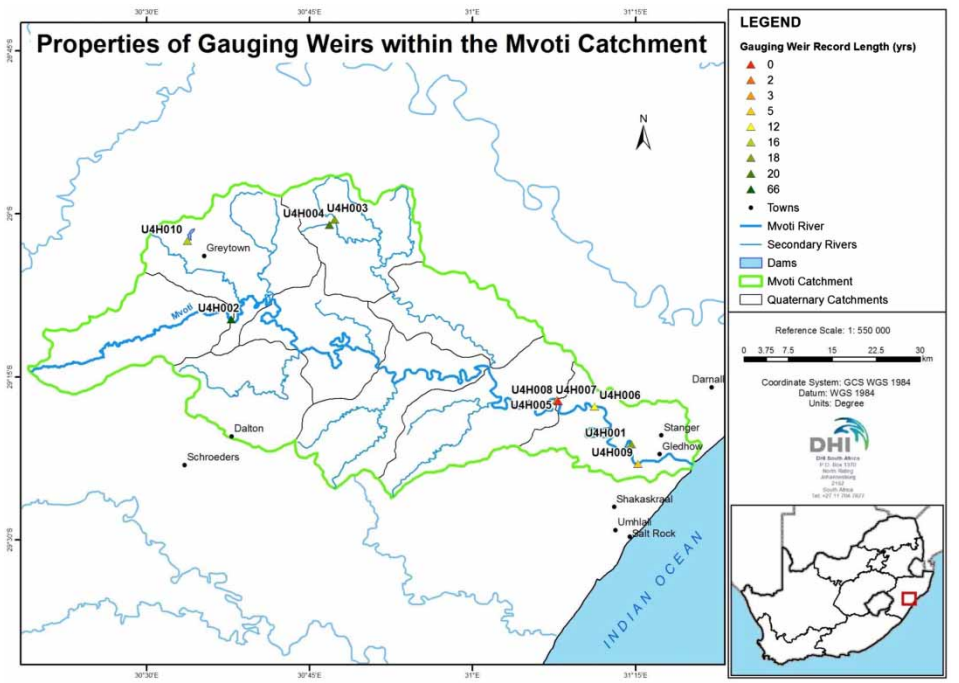

Fig. 5. The Mvoti River Basin north of Durban showing the location and status of gauging weirs (courtesy of the Danish Hydrological Institute).

100% certainty that the water supply infrastructure would fail in the next few months and there was an engineering race underway to build a pipeline from the adjacent oThongathi River as an additional source of supply into Hazelmere Dam (see Figure 6). The oThongathi River was also dry so this pipeline was tenuous at best.

None of this factual evidence was heard by the Water Tribunal, simply because the Chairman ruled such evidence as being inadmissible.

The conclusion regarding Driver 2 (climatic reality) is that the El Niño drought remained invisible to government until it hit. This was felt in the Mvoti River basin when the Umgeni Water potable treatment plant supplying the iLembe District literally ran dry. In the absence of scientifically verifiable data, sand mining operations were wrongly blamed for being the primary diverter of water. The Water Tribunal was dysfunctional, so application was made to the High Court that resulted in an order of court to the Minister of Water to reconstitute that body. This was done, but the Chairman ruled that no evidence could be led on the state of systemic failure of the rainfall and streamflow gauging stations.

Driver 3: transition from an extractive economy

What happened in the epicentre of the El Niño drought event as experienced by the loss of supply for the iLembe District Municipality was not an isolated incident. Its impacts can also be seen in the Vaal River which sustains 60% of the national economy and 45% of the total population of South Africa.

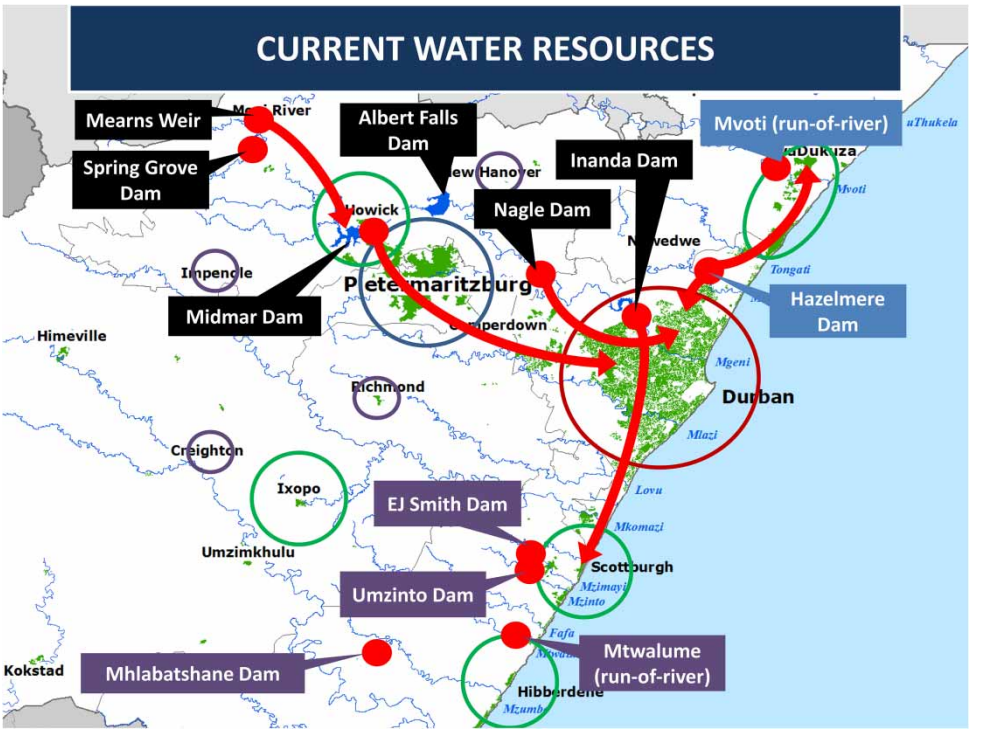

Fig. 6. Water resources for the greater Durban area showing the outlying run-of-river schemes including the Mvoti River site, all of which were distressed (Umgeni Water).

The facts in this matter are grounded on the growing levels of salinity in the overall system as shown in Figure 7. These data represent the situation as it was in 2006, at the end of the Mbeki regime and thus prior to the aggressive phase of patronage characteristic of the Zuma regime. Salinity is generally low along the upper reaches of the Vaal River (gauging stations VS1–7). There is a small spike in salinity at VS6 and a large spike again at VS8, coinciding with the point where surface water return flows come from the Witwatersrand Goldfields (DWA, 2012). From VS8 onwards, salinity remains high until the Vaal enters the Orange River. It must be noted that this dataset was generated before the 2015–16 El Niño event, so total dissolved solids (TDS) levels were lower by virtue of the dilution capacity still in existence at that time.

In response to the increasing levels of salinity in the Vaal, the Inter-Ministerial Task Team proposed the strategic water management scenario shown in Figure 8. System yield is represented on the vertical axis, with time on the horizontal axis. System yield drops dramatically after 2010, resulting in a growing but substantial deficit over time. The demand curve grows in a linear manner, even in response to an aggressive water conservation and demand management regime. The reason for the loss of yield is the need to release fresh water from the Lesotho Highlands Water Project (LHWP) to achieve the resource water quality objectives mandated by law. In effect, economic development is placed at risk because of this dramatic reduction in yield. A white arrow on the horizontal axis coinciding with 2020 represents the date by which Phase 2 of the LHWP needs to be online. It must be noted that even if this target date is met, there will still be a deficit with obvious implications for water security needed to sustain economic development for 60% of the national economy.

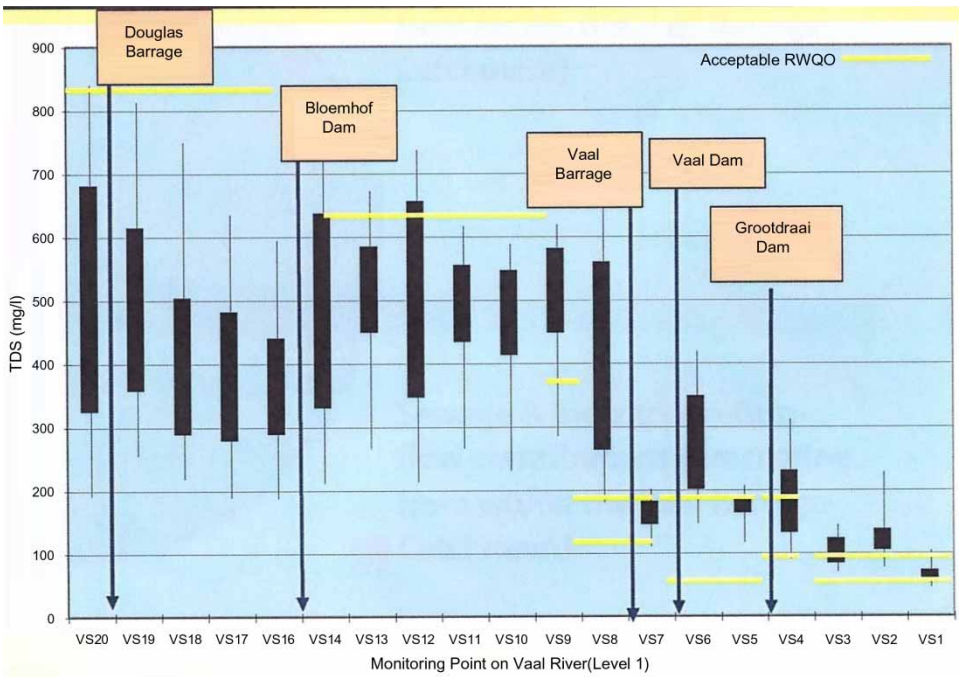

Fig. 7. Salinity values at various gauging stations along the Vaal River expressed as TDS in 2006 (DWA, 2012).

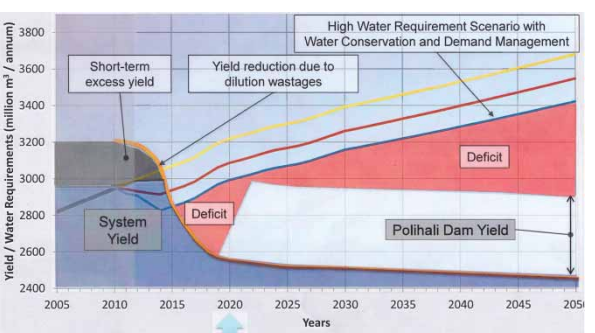

Fig. 8. Vaal River system short-term water balance showing the role played by Phase 2 of the LHWP (Polihali Dam).

Figure 9 shows the long-term water balance of the Vaal River system, with the desalination of acidic mine water having a dramatic effect on the yield. In effect then, the technical members of the Inter-Ministerial Task Team have developed a solution to a pressing problem of national strategic importance. But how important is the mining issue in the context of the national drought?

The importance derives from the fact that the Witwatersrand Goldfields (Davenport, 2013), once the largest contributor of gold to the world (Turton *et al.,* 2006; Hart, 2013), is now in a state of rapid decline (Hartnady, 2009; Turton, 2015), as shown in Figure 10. With a production peak in 1970, there are three distinct sub-cycles evident. The first peak in the 1930s coincided with relatively shallow mining to a depth of 1,000 metres below surface. The second peaked in 1970 and was driven by

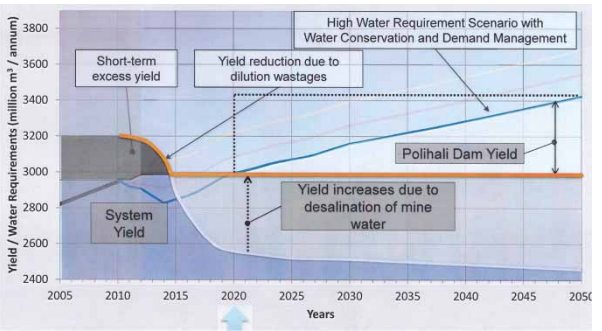

Fig. 9. Vaal River system long-term water balance showing the impact of desalinating mine water (DWA, 2012).

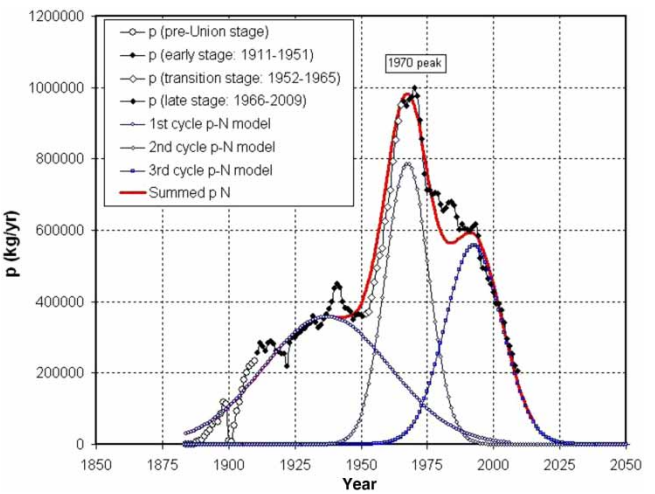

Fig. 10. Production from the Witwatersrand Goldfields showing three distinct sub-cycles with a near linear decline by 2020 (Hartnady, 2009; Turton, 2015).

advances in engineering needed for deep level mining (>4,000 metres below surface). The third peak coincided with the transition to democracy in 1994 and is driven by improvements in metallurgical engineering that enables residual gold found in old tailings dams to be recovered.

While gold mining is in a known state of decline, and the impact of flows out of abandoned workings has been assessed by the Inter-Ministerial Task Team on Acid Mine Drainage to be of major concern, the Ministry of Water did not seem to prioritize this matter.

The current Minister of Water was previously Premier of Gauteng Province. The Gauteng Provincial Legislature commissioned a report on mining residues to assess the risk (Hartnady *et al.,* 2011). This report clearly spelt out the multiple risks arising from the demise of the gold sector, all of which are exacerbated by the absence of a coherent strategy and policy. It could reasonably be expected that the Minister knew about the contents, given the strategic importance in both roles as Premier of Gauteng and subsequently as Minister of Water.

Rand Water Board commissioned a technical study, centred on a high confidence mathematical model, designed specifically to assess risk arising from the flow of acidic mine water (Hartnady

et al., 2012). The Minister would be aware of the contents of this report by virtue of the fact that Rand Water Board reports directly to the Ministry.

The Minister of Water is under investigation by the Public Protector regarding an attempted intervention in the procurement process for Phase 2 of the LHWP that would award a lucrative contact to a company owned by a financial backer of President Jacob Zuma (Timse & Ntaote, 2016). This particular company is already under investigation by the Special Investigating Unit (dealing with organized crime) for alleged tender fraud in the water sector.

At the same time, the Minister is also defying the National Treasury regarding the appointment of a controversial Chairman of an about-to-be mega Water board, arising from the merger of Umgeni and Mhlathuze water boards in KwaZulu-Natal (Masondo, 2016). This is significant because it is here that the El Niño drought is at its severest, but this merger has nothing to do with the drought. The Chairman designate is also Chairman of the Zuma Foundation and is also the embattled Chairman of the bankrupt South African Airways (see http://mg.co.za/article/2015-11-27-00-how-myeni-broke-saa). So the water board itself appears publicly to have more to do with the patronage politics which many see so deeply entrenched under the Zuma regime. It also demonstrates a deterioration in the dialogue needed between technical and political in meeting drought uncertainties so necessary to assuring water security.

Implications for economic development and job creation

It is reasonable to conclude from the analysis presented above that the ruling party in South Africa, as it is currently constituted, is less interested in matters such as drought management than in the politics of patronage. The general suspicion of western-based science, ushered in by the Mbeki regime and manifesting as AIDS-denialism and the politicization of DDT for the control of malaria, has resulted in a slow but steady decline in data capture, processing and management systems needed for water resource management. The outcome of the Mbeki-era's short-sighted policy approach driven by science scepticism is now manifesting as a significant loss of human lives, as people living with AIDS were unnecessarily denied access to anti-retroviral medication. Sadly, it is also manifesting as a cohort of children born with urogenital defects (Bornman *et al.,* 2005, 2008, 2009) and men with impaired semen quality (Aneck-Hahn *et al.,* 2007) due to the reintroduction of DDT (Cone, 2009). This science scepticism has merely been accelerated by the Zuma regime.

When the priority is self-enrichment, with collaboration by a select few, then it is easy to understand how water boards and other parastatals become significant vehicles for the dispensing of patronage. In the Vaal River system, a deliberate delay to the implementation of Phase 2 of the LHWP has exposed 60% of the national economy and 45% of the total population to the risk of acute water scarcity exacerbated by the El Niño event.

Indeed, the restructuring of two water boards in the epicentre of the worst drought on record, without any benefit to those affected by the drought, deserves closer scrutiny (Timse & Ntaote, 2016). In strictly institutional terms, the Minister of Water has no reason to defy the National Treasury. However, this action is consistent with the battle currently waging between the President and the Minister of Finance (Whittles & van Wyk, 2016). Unfortunately, this places the Minister of Water primarily supporting the President and his patronage base. However, most see such action as inconsistent with the legal mandate of the Minister of Water as defined in the National Constitution and National Water Act.

The implications are stark. The South African economy has been stagnant for a decade, with high levels of unemployment and the ever present risk of a ratings agency downgrade to junk status. The El Niño drought event has merely exacerbated what is already a national disaster. The actions by the state, as evidenced in the sand mining case along the Mvoti River, show that systemic dysfunction is deeply entrenched, with the Water Tribunal itself having been resuscitated only because of an order of the High Court.

The delay of Phase 2 of the LHWP, in spite of an extremely strong case developed by the competent technocrats who have survived various purges, suggests that water resource management is playing a secondary role to tribal and patronage politics. Yet in spite of this, the drought persists because it takes no sides in any power struggle between political elites.

The only conclusion that can be drawn with any confidence is that South Africa now faces the gravest drought in recorded history. The impact of that drought on the economy, livelihoods and human suffering cannot be assessed at this time. The part played by political decay has yet to be evaluated by scholars.

Policy implications

The most significant policy implication is that measurement systems for all parameters related to water resource management need to be managed and adequately resourced if the impact of drought is to be mitigated. The impact of climate change, most notably manifest as the rising peaks in Figure 4, have strategic implications. We can reasonably anticipate a deep and protracted drought, possibly of decadal duration, across the entire Southern African area. Work done by South African members of the IPCC indicate that while a global average increase in temperature of 2 °C is survivable, the actual case in South Africa is likely to be closer to 5 °C in certain parts of the country (Scholes *et al.*, 2015). The impact of this startling fact on food security needs to be carefully considered (Reeve & Entholzner, 2016).

Conclusion

The El Niño drought of 2015–16 has provided an excellent opportunity to analyse the response by the South African government. A growing body of evidence suggests that the state response has been inadequate. This has been driven by the broader political milieu in which water resources drought policy and decision making is embedded. Science has become politicized, with an unfortunate linkage having been made to colonial rule. This has undermined the scientific community and has meant that evidence-based policy reform has failed. Instrumentation systems have been neglected and allowed to fall into a state of dysfunction, which means that the early onset of the El Niño event in 2014 was not noticed until the people of iLembe suddenly ran out of water, threatening social stability. Nothing that the government can do now will have major impact on capacities to adapt to the drought impacts. Indeed, the main adaptation policies have become battening down the hatches and surviving as best one can.

The big lesson to be learned is that the El Niño severity is likely to increase, so the next event can be better planned for. This will only be possible once the institutions of state are reformed. The prognosis

for this is good, because the Constitutional Court and Chapter 9 Institutions like the Public Protector have been tested and found to be robust in spite of the many attempts to circumvent them.

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